Volume 61

American Machinist

New York, July 3, 1924

Number 1

Fiat Automobile Production Methods

By J. A. Lucas and F. E. Bardrof

Machining operations on pistons—Cast aluminum pistons with iron wearing rings cast in place—Use of special jigs, fixtures and machines

FIAT pistons are made of aluminum, the feature of the design being the use of two cast-iron rings to take the wear during the operation of the motor. One of these rings is located just above the wristpin hole, the other being placed near the bottom or skirt end. As a matter of fact the aluminum body of the piston does not touch the wall of the cylinder at all, the only points of contact being provided by the wearing rings and the three spring piston rings mounted in the usual manner near the top of the piston. The wearing rings can be ground very closely to dimension so that this design possesses the advantage of accuracy as well as lightness. Fig. 2 shows the casting ready for machining and indicates the method of casting the wearing rings, that are of cast iron, in position.

This is the sixth article of the Fiat series. The fifth article was concluded on page 931, Vol. 60, No. 25.

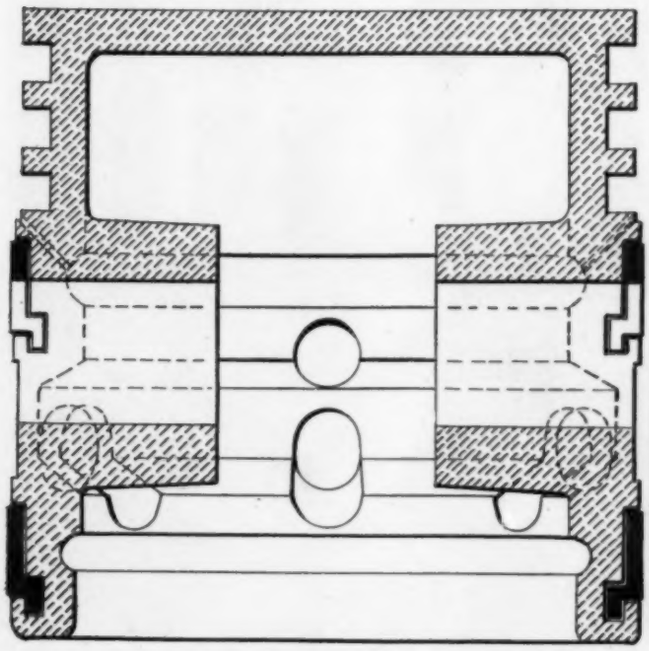


Fig. 1—Cross-section through finished Fiat piston

Since the coefficients of expansion of the body of the piston and the wearing rings are different, it is necessary to make an allowance for the unequal expansion. This is done by leaving a cored space in the body of the casting next to the inside surface of the ring so that either part can expand independently of the other. Fig.

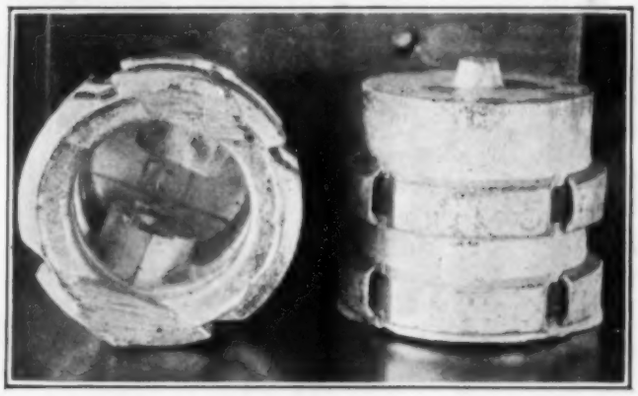


Fig. 2—Piston casting, wearing rings cast in place

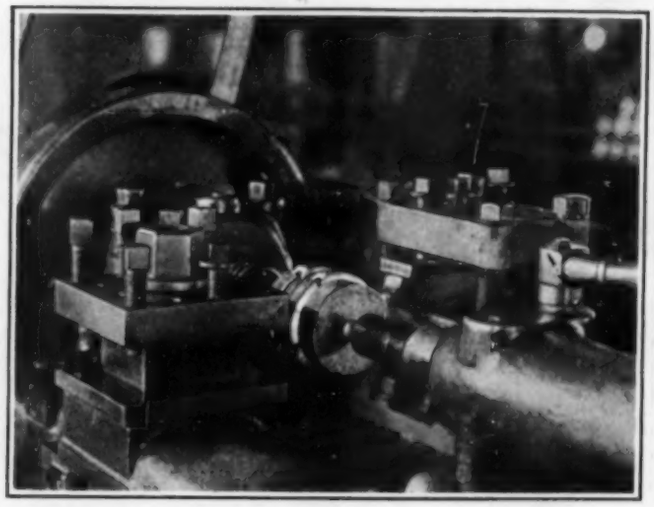
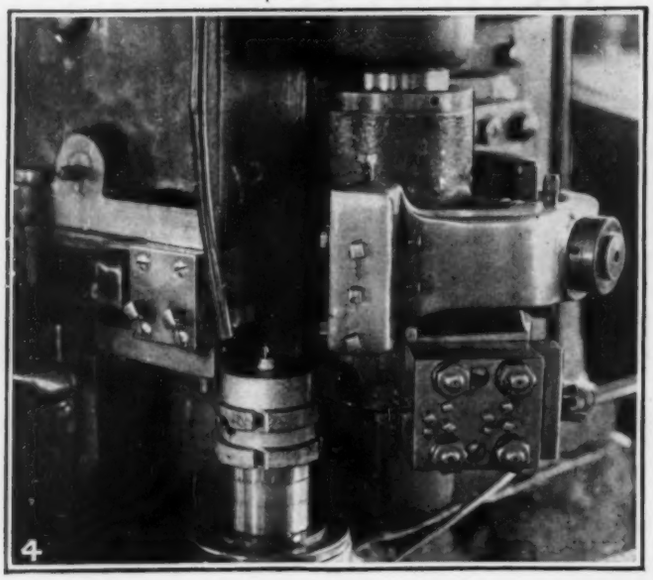
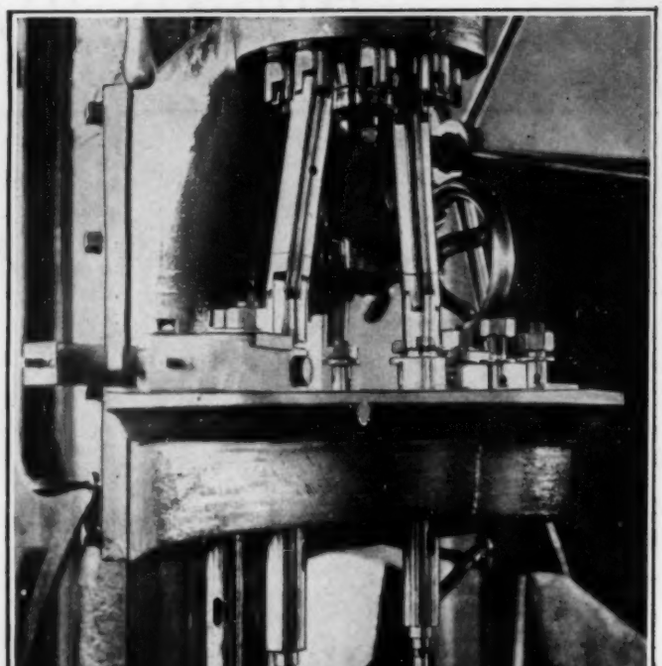
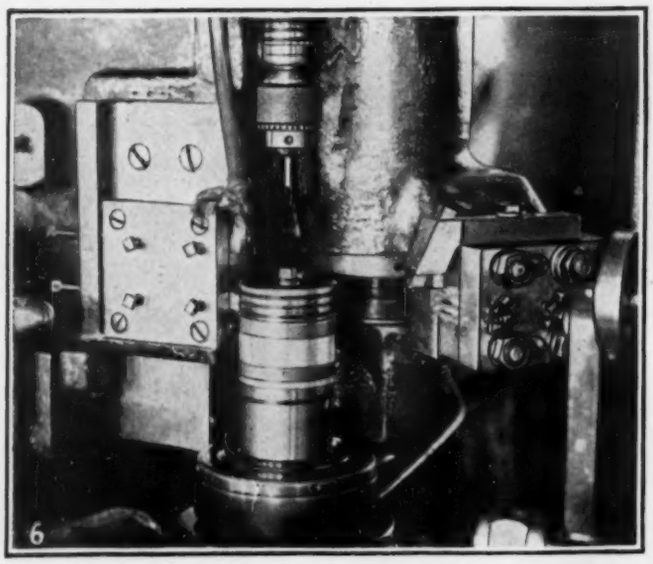
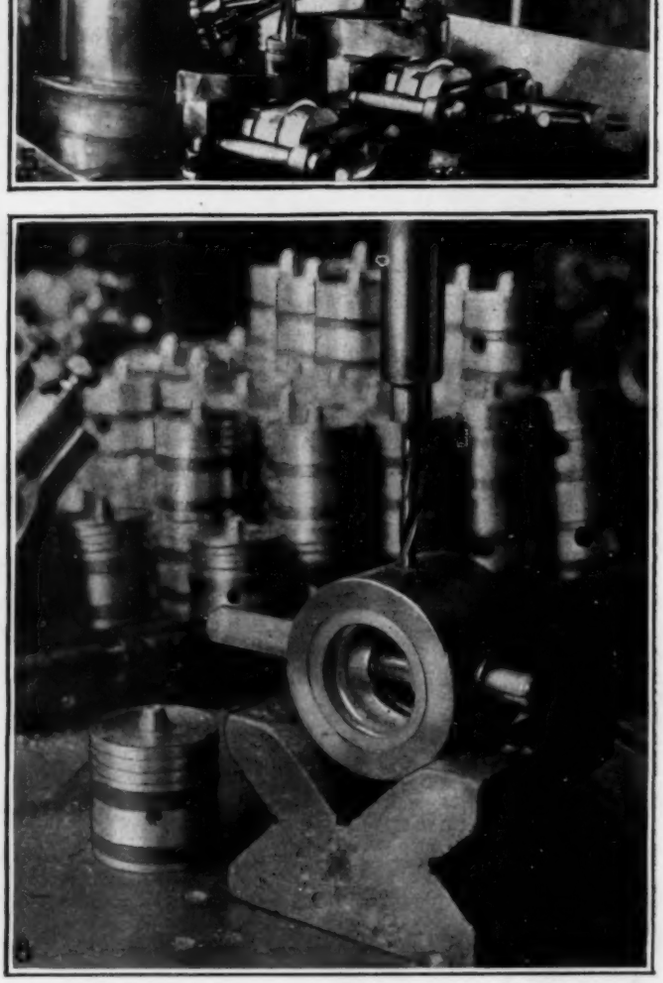


Fig. 3—Machining bottom end to fit holding fixture









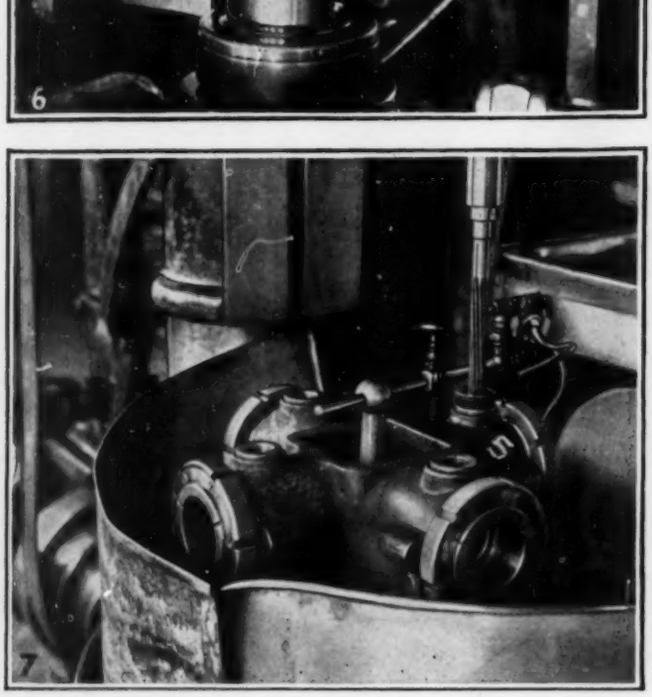
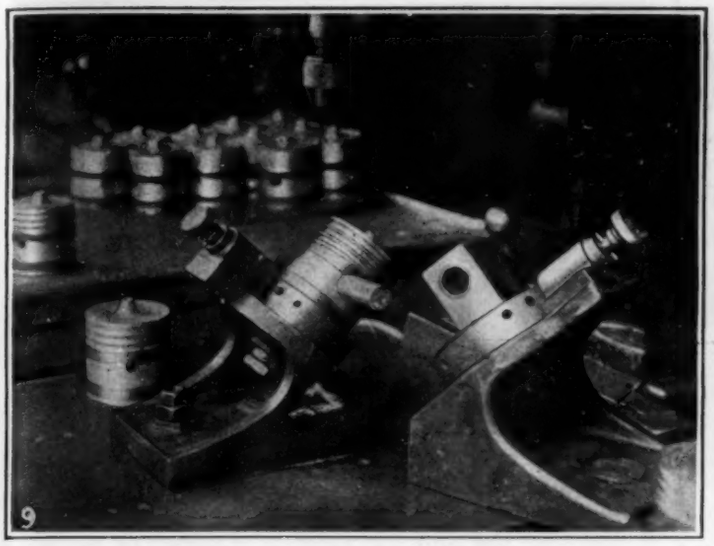


Fig. 4—Casting ready for rough turning and facing on a Foote-Burt piston-turning machine. Fig. 5—Foote-Burt multiple-spindle drill used to drill wristpin holes. Fig. 6—Finish turning and facing on Foote-Burt machine. Fig. 7—Wristpin holes reamed in fixture. Fig. 8—Drilling two holes for inserting rod taper pins.



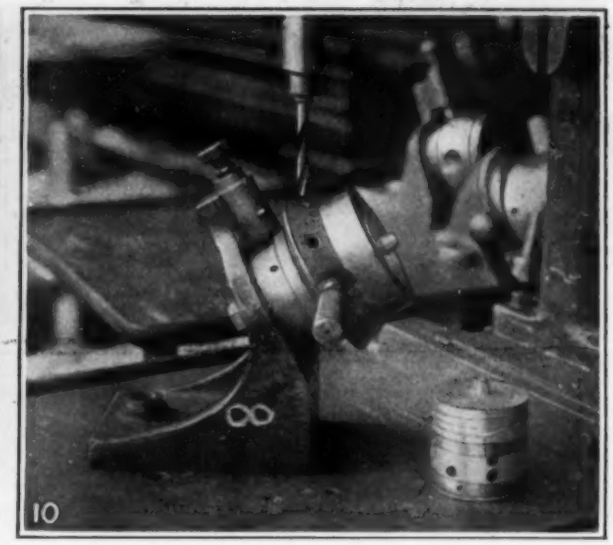


Fig. 9—Small oil drainage holes drilled in indexing fixture. Fig. 10—Indexing jig used to drill lubricant holes in the skirt

1 is a cross-section of a finished piston and shows the position that the wearing rings occupy in the finished part.

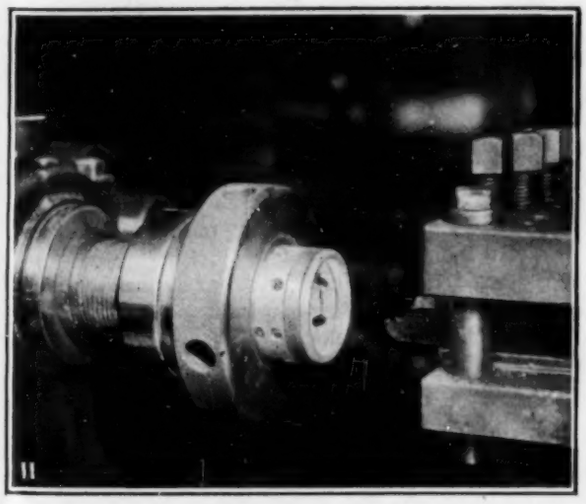
The first operation performed on the rough casting is to bore and face the bottom end, so that the casting will fit the fixture on the next machine. Fig. 3 illustrates this operation, the work being done by tools held in the turret-type toolposts of an ordinary cone-head lathe. The casting is held on a two-jaw expanding chuck attached to the spindle of the lathe.

The lower end of the casting will now fit the work-holding fixture of the Foote-Burt piston-turning machine shown in Fig. 4, and this machine is used to rough turn the side and face the top of the piston. The operation of this machine has already been described in the *American Machinist* and is probably well enough known so that it requires no further comment here. A great many high-production American tools of this sort are in daily use in the Fiat automobile plant.

The drilling of the wristpin holes in the roughly turned casting is illustrated in Fig. 5, the machine shown being a Foote-Burt multiple-spindle drill. No turned castings were available when this picture was made so a couple of unfinished pistons were placed in the fixture to show the method of clamping. After the rough drilling operation the piston is again mounted on a fixture on a Foote-Burt piston-turning machine, as shown in Fig. 6, where the side and top is finish turned and faced, the ring grooves are cut, and an accurate center hole is drilled in a spud at the top.

The next job is the reaming of the wristpin hole. The multiple fixture shown in Fig. 7 was actually designed for use on a multiple spindle machine but the machine was not yet available for use when this picture was made. Fig. 8 shows the method used for drilling two holes for the insertion of the connecting rod taper pin. The piston is located in a cylindrical jig by means of a mandrel through the wristpin holes, the jig being mounted in a V-block on the drill table.

At the lower edge of the bottom ring groove a series of small diagonal holes are drilled to drain the excess lubricant into the inner space of the piston, the fixture upon which the piston is mounted for this operation being shown in Fig. 9. Two of these simple indexing fixtures are shown, the work being located on the apparatus by means of a mandrel passed through the wrist-



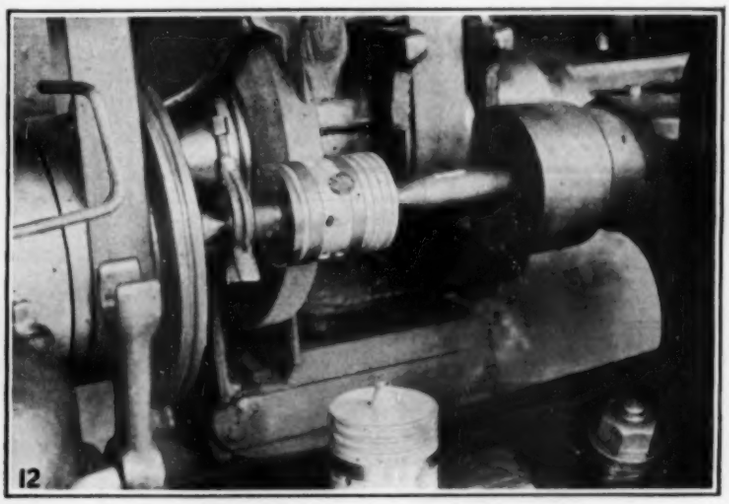


Fig. 11—Rounding the bottom edge of the skirt. Fig. 12—Wearing rings accurately ground to diameter on Landis grinder

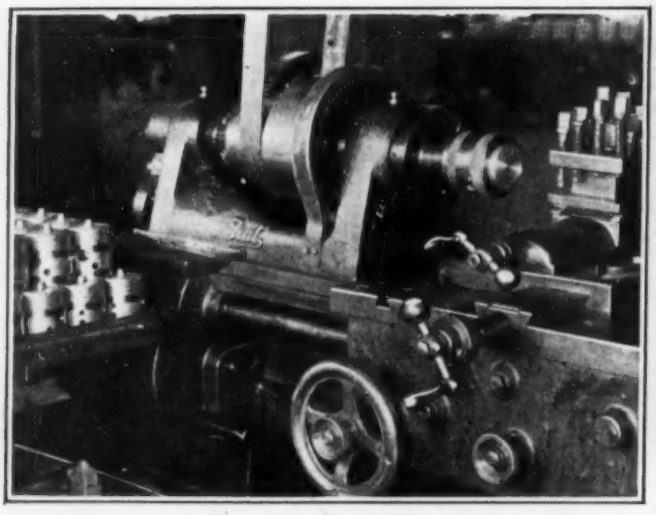


Fig. 13—Removing the top center spud and finishing

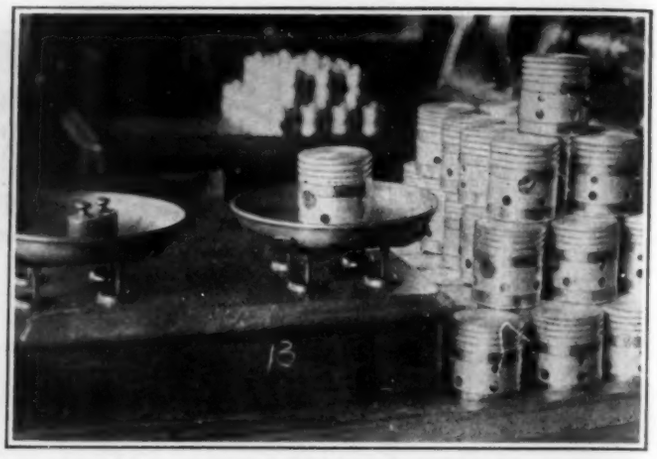


Fig. 14—Determining weight of finished pistons

pin holes. The design of the positioning lug is clearly shown by the empty fixture at the right. To insure an ample supply of lubricant between the piston and the cylinder, six larger holes are drilled near the bottom of the piston as shown in Fig. 10. The oil is splashed from the crankcase into the interior of the piston and passes through these holes to the cylinder walls.

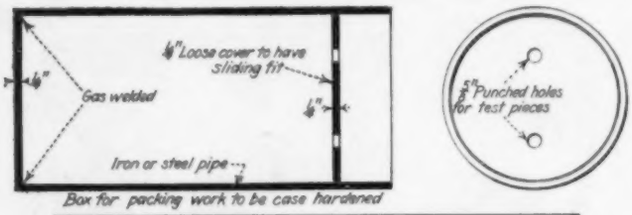
The partially finished piston is now clamped in a suitable chuck as illustrated in Fig. 11 and the bottom end is rounded. A special centering plug is then placed in the open end and the piston is mounted on centers on a Landis plain grinding machine, as shown in Fig. 12, for grinding the cast-iron wearing rings. With the completion of the grinding operation there is no further use for the center spud on the top of the piston and it is therefore removed as shown in Fig. 13, the piston being chucked on its outside diameter so that the finished top face is square with the body. The completely finished pistons are then weighed and selected as shown in Fig. 14, and are ready for assembly.

Casehardening in a Railway Shop

BY CLIFFORD H. FRENCH

The practice of the Santa Fé Railway in casehardening work may be useful to those who occasionally have work of this kind to be done. The practice is to use a commercial carbonizing mixture in the proportion of 8 lb. of mixture to a bushel of charcoal, the sweepings from charcoal piles being preferred. The carbonizing material is put up in barrel lots, but is mixed in bushels at a time in order to insure a more thorough mixing of the ingredients.

The boxes used are made of iron or steel pipe in four sizes, from 6 to 12 in., as shown in the illustration and its accompanying table. The table also gives the



Box for packing work to be case hardened

Size of pipe	Lengths	Time in Furnace
6"	16" and 24"	3 to 4 hours
8"	16", 24" and 30"	5 to 6 "
10"	24", 30" and 40"	7 to 8 "
12"	40"	7 to 9 "

Casehardening boxes of pipe

length of the box and the time allowed in the furnace after being heated to the proper temperature, which is from 1,600 to 1,800 deg. Fahrenheit.

The boxes have ¼-in. plates of tank steel, gas welded in the end, for bottoms. The covers are pieces of the same thickness of steel cut to form an easy fit inside the pipe, each having two ⅝-in. holes punched or drilled about half way between the center and the edge.

In packing the box or pipe, the bottom is first covered with a layer of the carbonizing mixture from 1 to 1½ in. deep. The pieces are packed at least ½ in. apart and ¾ in. from the pipe itself. As the pieces are put in, they are covered with the mixture about 2 in. deep over the top or ends of the work. The loose head is put in place and sealed, or luted, with fire clay. The length of pipe used should also allow from 1½ to 2 in. of fire clay over the head.

Before sealing a ½-in. test rod is put through each hole in the cover. The rods should be long enough to reach to the center of the pipe and stick out about 2 inches.

After the work has been in the furnace the minimum time given, one of the test pieces is pulled out and quenched. The end that has been inside the pipe is broken to see if the case is deep enough. If not, the hole in the cover is plugged with fire clay and the box heated another hour, then the second test piece is tried. The work should not be kept in the furnace longer than necessary to secure the desired depth of case as too much heat crystallizes and weakens the metal. The head of the box can be removed by using a hook in one of the test holes.

In some shops the contents of the boxes are dumped into the cooling tank, the work being caught on a screen and the carbonizing material shoveled out when the tank is drained. In others, the work is removed from the pot with tongs and dropped into the cooling tank. In either case, care should be taken to prevent the temperature of the quenching water being raised to a point that will prevent proper hardening. If much work is to be hardened, the water should be circulated by running in fresh water at the bottom and providing an overflow at the top for the heated water.

A Good Railway Shop in the South

By Fred H. Colvin
Editor, *American Machinist*

Good signs for safety and prevention of waste —Cylinder bushing and an economical method of handling locomotive tires on and off wheels

WE ARE very apt to forget that the South played a very important part in the early railroad history of this country, but such is the case. Macon, Ga., had a passenger train running north as early as 1838. Two years later, in 1840, the Central of Georgia railway reached Macon and was for several years the longest railroad in the world. Macon is still the mechanical headquarters of the Central of Georgia and its shops at this point are much better, both as to buildings and equipment, than will be found on many larger roads.

The construction of the Macon shops is somewhat unusual. A saw-tooth roof extends crosswise of a three-bay shop. The two outer bays are of traveling-crane height and the center bay has a second or mezzanine floor for the tool room and light work. Both traveling cranes of high lift and jib cranes of wide range serve the machine-shop side of the shop, while one crane in the erecting bay can handle any locomotive on the road, over the others, and place it wherever desired.

One interesting feature of the shop is the amount of new machine equipment which has been acquired during the past year or two. More is on the way. Both milling and grinding machines are making their way into these shops and there is every evidence that the shop executives are alive to the advantages of modern machinery. The tool-room equipment is being increased by the addition of well known, high grade machinery especially adapted to this work.

Fig. 1—Record of departmental injury

Fig. 2—A morning greeting

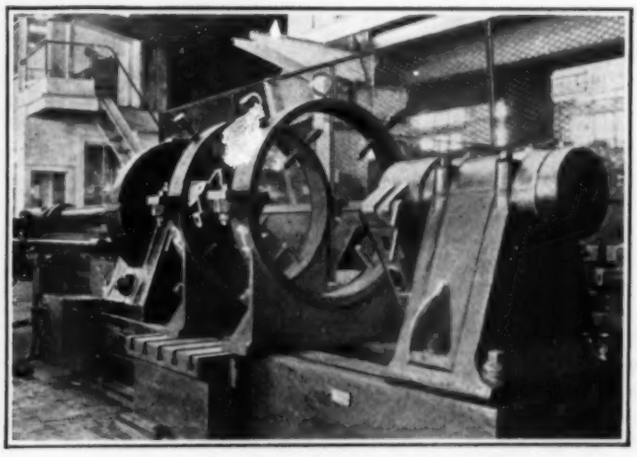


Fig. 3—Fixture for cylinder linings

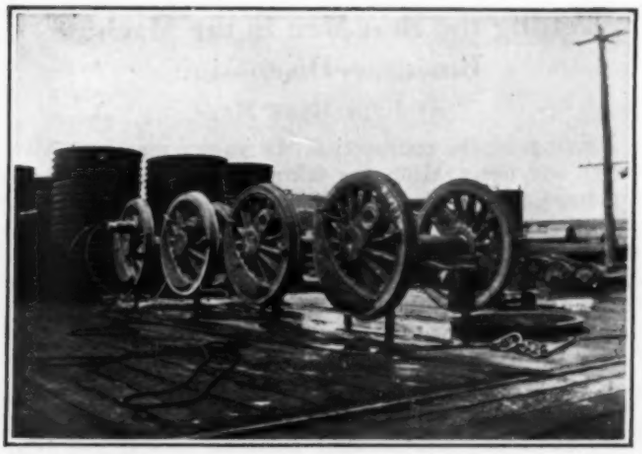


Fig. 4—Rack for tiring wheels

Fig. 5—Furnace for heating tires

The Central of Georgia is conducting a steady campaign against personal accidents, and with good results. One method of keeping the matter constantly before the men is in the use of signs in the various departments, an example of which is shown in Fig. 1. The numbers are changed daily and the record of the department is always in front of the men. Another sign, Fig. 2, painted on the end of the shop which the men see as they come to work, calls attention to a vital point in the expenses of any railroad.

In Fig. 3 is shown the simple and effective fixture used for centering and holding cylinder liners for boring. It is used in connection with a Newton boring machine. The fixture is in halves, the upper part being removed to put the liner in place.

Wheels are "tired" in the yard just out of the shop, the climate usually permitting this at all seasons. After the wheels are removed from the locomotives they are rolled out to the rack shown in Fig. 4 which consists of two rails supported at the proper height to permit the largest wheel to clear the floor. Here the tires are removed by the usual type of gas-ring heater. For replacing tires, a more economical heating method is employed, the oil fired furnace shown in Fig. 5 being employed. This furnace has a steel shell outside the fire-brick lining and a heat retaining cover. It holds the complete set of tires and heats them all uniformly and at once. The tires are handled by a gantry crane which runs over the storage yard and a set of 8 tires is put in pace in 50 minutes.

Getting the Best Men in the Machine Business—Discussion

BY JOHN MARK MAY

Judging by the course that the young men and boys under our observation are taking, it has been evident for some time that a shortage of recruits for the machine business was more likely to become greater than smaller for the better class of craftsmanship and executives. John R. Godfrey's article under the above title on page 781, Vol. 60, of the *American Machinist*, brings out the needs so plainly that all of us who are interested in this important matter should give expression to our views.

I believe that Johnson's son Tom is thinking along the right line. His thought must be crystallized into action as fast as conditions will allow.

Keeping Wheel Chucks in Order

BY CLIFFORD H. FRENCH

In order to have car and truck wheels bored true with the treads, it is the practice of the Santa Fé System to pay special attention to the jaws of the chuck on the boring mill table. The jaws are bored, and turned with rounded corners to conform to the fillet on the wheel, as shown in Fig. 1. A clearance of at least ¼ in. is provided between the wheel and jaws, at *A*. The wheel is supported by its flange resting on the top of the jaws. All tires, both for cars and locomotives, are bored in the same sort of a chuck, with the flanges supported in the same way.

The chuck jaws are tested once a week, using the method shown in Fig. 2, to detect if they are worn out of true. Before testing, the jaws are closed toward the center as far as they will go and wooden wedges are driven in at *A* to take up any slack in the jaw screws. The vertical faces of the jaws are tested by a tool and toolholder as shown by the solid lines. The rounded corners are tested by scribing the jaws

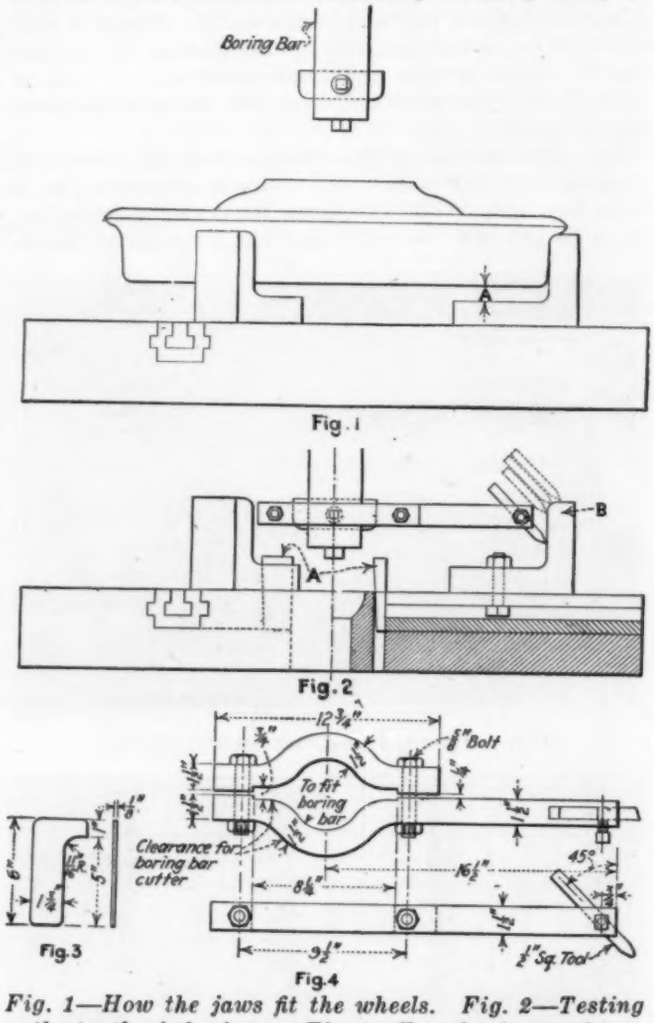


Fig. 1—How the jaws fit the wheels. Fig. 2—Testing the truth of the jaws. Fig. 3—Templet for testing the jaw contour. Fig. 4—Tool for boring the jaws

lightly as the table revolves with the tool placed successively in each of the three positions shown by the dotted lines at *B*. The contour of the jaws is checked by the templet, Fig. 3. The rounded corners are trued by filing them to conform to the scribed marks and to the templet. Fig. 4 is the tool holder.

A Workable Production Control System

By Edward Davis
Production Manager, Edison Phonograph Works

Inspection of parts and transportation methods—Production office records of interdepartmental shipments—Some of the advantages and savings obtained from the system

HAVING considered the manner in which production is started and controlled in all departments, the next step is the inspection of the parts produced and their handling. As each machine tool is set up, the first pieces produced are submitted to the department inspector and, if these are found satisfactory, the machines are started. A floor inspector checks the parts during the day and shuts down any machine that is not producting work up to the standard. The shutdown is then reported to the department superintendent with the reasons for holding up the work. The department superintendent corrects the setup if wrong and, after submitting the new pieces to the department inspector, the operator is allowed to proceed if the new pieces are satisfactory.

Fig. 16—Elevator operator handles parts in trays

At the end of each day if the part is a large one; or at the end of a run if the run does not take over a week; or, in case of a long run, at the end of each week, the work is taken out of the machine, washed and passed to the inspectors, who occupy a suitable space set aside for their use in each stockroom. As each run of work is inspected, the rejected work is laid aside, the accepted pieces being passed over to the stockkeeper, who checks the amount and places it in stock or, if required at once for shipment, counts out the number of pieces scheduled for shipment. An interdepartmental shipping ticket is then made out and placed on the work which is then set to one side ready for shipment. These shipping tickets are made out in triplicate, the original and duplicate traveling with the work to the department designated at the top of the ticket.

The stockkeeper in the department receiving the shipment signs the duplicate ticket and sends both to the chief storekeeper, the triplicate copy of the ticket being sent directly to the chief storekeeper from the department making the shipment. These shipping tickets are numbered serially, each department having a separate series. The chief storekeeper checks the triplicate copy with the signed duplicate and, after checking the serial numbers to guard against lost tickets, sends the triplicate copy to the production department. After the production department has made its check in the master control book, the tickets are forwarded to the accounting department for filing.

In each department a space to be used for a shipping point is marked off on the floor, these shipping points being a few feet in front of the freight elevator except in the one-story buildings, where they are located convenient for both the stockroom and trucking. The operator of the freight elevator in the main building makes regular trips, stopping at each floor to pick up trays of parts placed at the shipping point for delivery, as shown in Fig. 16. Such trays as he may have picked up at the other floors are delivered at the same place and the stockkeeper, after placing his shipments at the shipping point, picks up any parts that were delivered to that point from other manufacturing departments.

None of the bulky parts are moved during the regular working hours. These are taken care of by the truckers and elevator man after hours, as shown in Fig. 17, and are delivered directly to the space provided near the first of the group of machines in the next department. Neither do these bulky parts travel into the stockroom, for they are inspected at the end of the operation line, the stockkeeper counting the parts and placing his shipping ticket on the work at that point. The parts are picked up by the truckers that night and delivered to the next department, ready for oper-

Concluded from page 914, Vol. 60, No. 25.

Fig. 17—Shipping station for night trucking

ation the next morning. In the event that the inspector rejects enough work so that the amount passed is not sufficient to cover the scheduled shipment, the stockkeeper draws enough parts from his work-in-process allowance to make up the deficiency, as has been previously explained.

To the production department falls the duty of checking all shipments to avoid mistakes and misunderstandings and to insure the meeting of schedules by all departments, if possible. The duties of this department are, therefore, twofold: first, the setting of schedules, and second, the supervision of the operation of the manufacturing departments under the schedules. The forms and procedure for checking purposes are simple but effective.

The triplicate copy of the interdepartmental shipping ticket is sent to the production department each morning. A clerk sorts the tickets, placing them in numerical order by part numbers and checking the serial numbers of the shipping tickets to guard against lost tickets. After sorting, the record of the shipments is made in the master control record book.

One of the control record books is shown in Fig. 18, and consists of 4½x10½-in. loose-leaf sheets suitably ruled and printed and held in a Visible Equipment Co. binder. These sheets are arranged in numerical order by part number with a sheet for each department that operates on the part, arranged in the order in which they operate. Fig. 19 shows three sheets as they would appear in the book. The first, or prime department, sheet is colored blue and the rest are white. The sheets for shop order control are salmon-colored, to aid in ready reference.

As the stockkeeper has written in the lower left-hand corner of the shipping ticket the figures designating the period the shipment is to cover, according to the control board in that department, reference to the control sheet on that part number and for that department will quickly show whether the master record and the shipment correspond. For example, Fig. 20 illustrates a shipping ticket for part No. 73620—Support Bracket, and shows that 500 pieces were shipped on January 10 from the Polish & Buff department to the Drill Press department. Reference to sheet marked "P&B 73620" will show that the last shipment covered the period 1-3, or the third day of the second week of the year.

This was January 9 and, since the shipping ticket is marked 1-4, the control board and the master record correspond, and a record of the shipment of January 10 is made by placing a mark in the fourth space in the second week, as illustrated in Fig. 21. The mark is made by a small square stamp. In the case of shipments against shop orders, the shipping ticket is marked "S.O." in place of the period marking, as shown in Fig. 22, and an entry is made on the proper shop order control sheet, Fig. 23 illustrating the sheet with the entry made.

Actual practice has demonstrated that one clerk can check off the shipping tickets covering a day's deliveries between departments in approximately one hour. This is true regardless of the size of the schedule for, although the amount shipped might be smaller or larger, the number of shipments would not vary to any

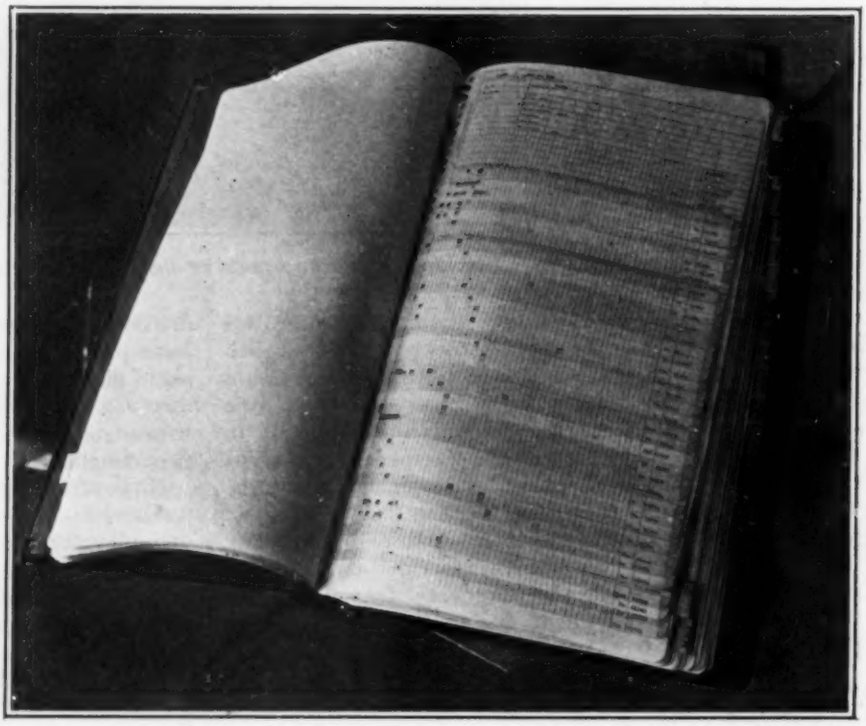


Fig. 18—Master control record for interdepartmental shipments

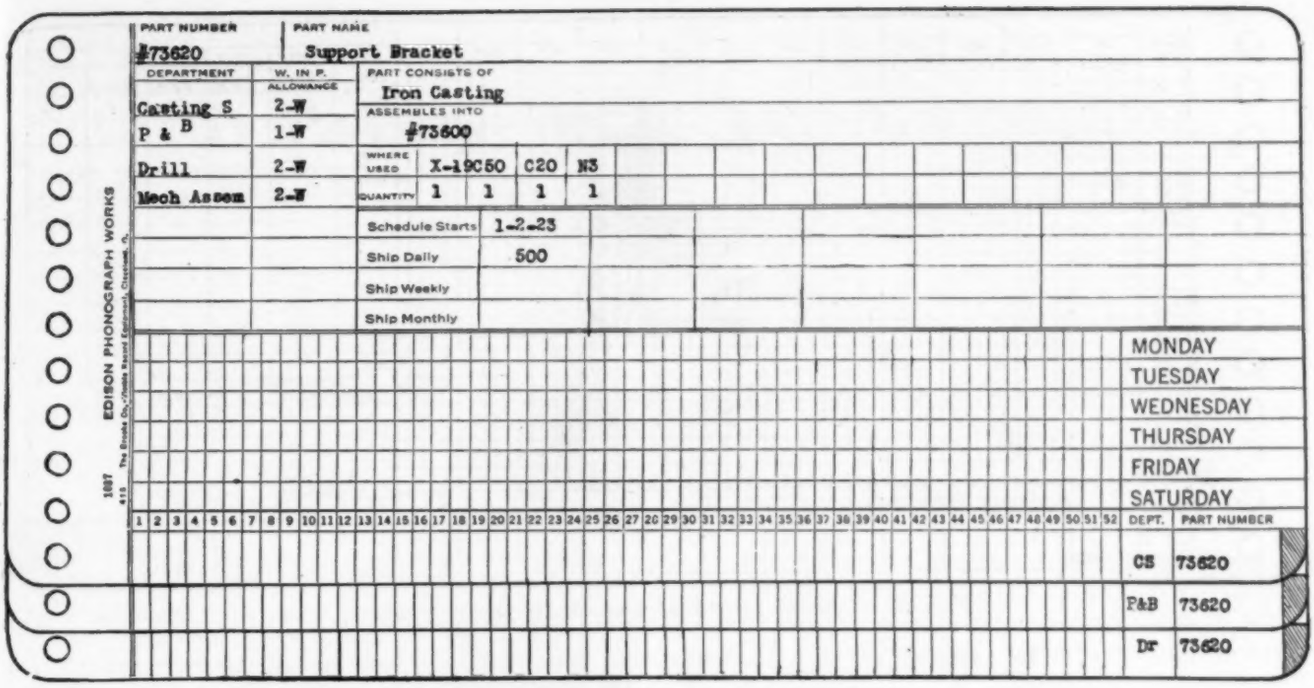


Fig. 19—Three sheets from control book

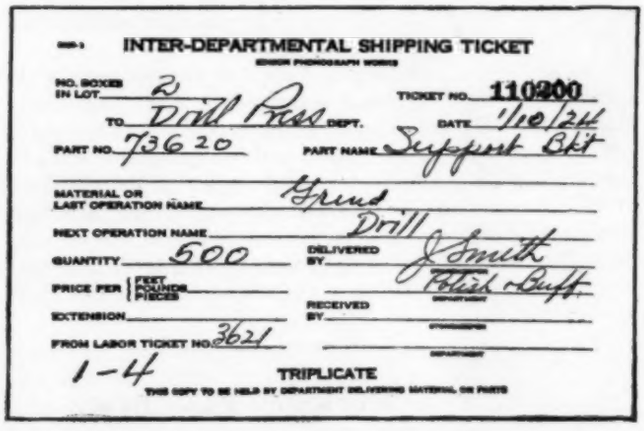


Fig. 20—Shipping ticket for scheduled parts

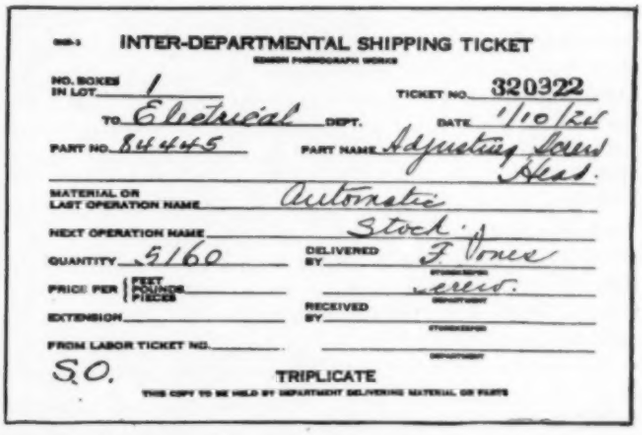


Fig. 22—Shipping ticket for shop-order work

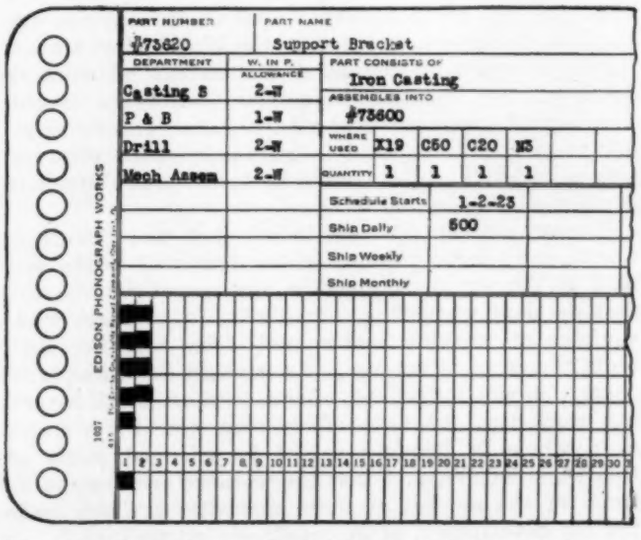


Fig. 21—Control record of shipment of scheduled parts

extent. In fact, the total time consumed in the production department in checking shipments does not average over four hours for one clerk each day. This includes the sorting of tickets in numerical order by part numbers; checking the master record; re-sorting the tickets into departments and each department in numerical order by ticket serial numbers; the making of new control sheets when necessary due to changes in routing; and all other necessary duties.

This system of control has gained the co-operation of the department superintendents, because a visible record of the control is located in their departments where they can check their production quickly and accurately without reference to a lot of figures. The control board is an automatic plan of their work and is correct to the minute, showing at a glance the parts that are behind or ahead. It has relieved them of the constant annoyance of a group of stock-chasers continually upsetting their plans, and guarantees a constant quantity to be operated on. The added annoyance of having dissatisfied operators and constant changing of machine set-ups, due to irregular shipments and uneco-

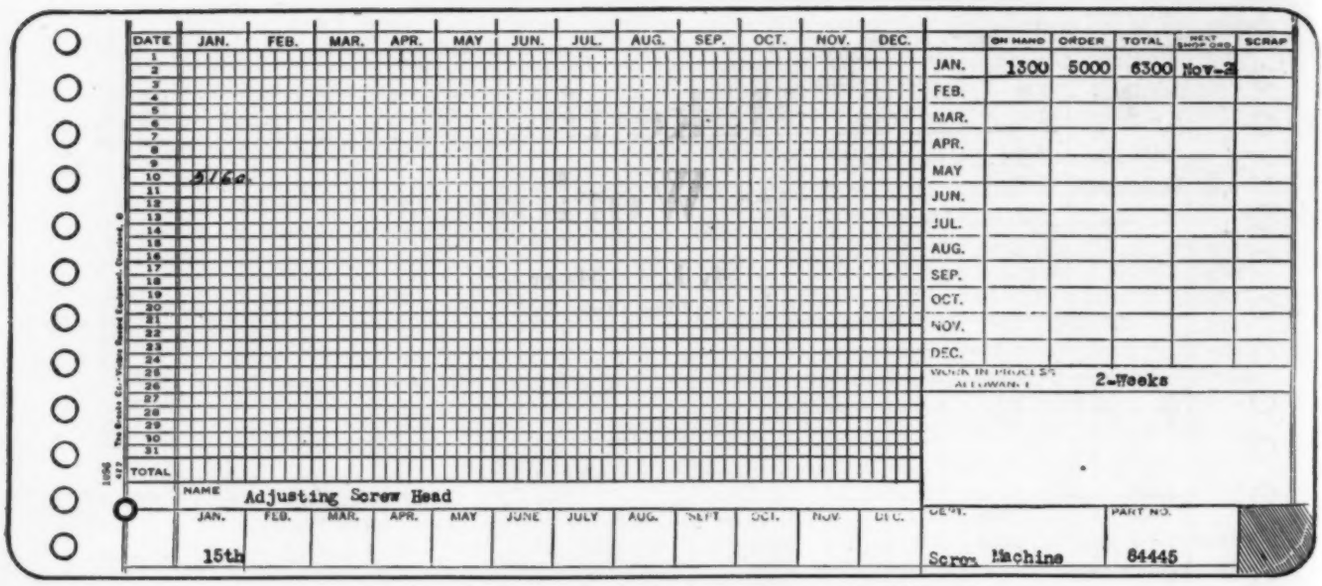


Fig. 23—Control record of shop-order parts shipment

nomical quantities to be operated on at a moment's notice, is also eliminated.

The stockkeepers are better satisfied, since they have less shipments to make, and are enabled to plan their work to better advantage, due to the orderly method in which shipments are made. It must also be apparent that the operations throughout the entire shop are much more orderly than would be possible under the former methods and, on account of the regular quantities operated on at stated intervals, the cost of operation must necessarily be less.

The same thing applies to trucking. Whereas we formerly had a force of twenty-five truckers and three elevator men, we now have two truckers and one freight elevator doing the work to much better advantage than was possible with twenty-five truckers carting miscellaneous quantities at irregular times.

One of the greatest advantages of the system is its ease of installation and its small cost. It can be installed in one or more departments piece-meal without disorganizing any prevailing schedule, and will immediately show its advantages.

The card holders used on the control boards are a regular stock article manufactured by the Grammes Co., the office control books being manufactured by the Visible Equipment Co., for which the Brooks Co., Cleveland, Ohio, is the Eastern distributor. One of the features of the office equipment is the ease with which the control sheets can be shifted to keep them in perfect numerical order by part number, and each group in proper sequence according to routing. Each book has capacity for about 750 control sheets, but they can be easily carried into a conference or any other place for quick reference.

Another advantage is the decreased clerical force necessary to run this system. The production department previously had a personnel of about forty people. We now have four, and at the same time a closer and better control than was formerly possible is maintained.

The inventories of work in process and of raw materials have been gradually reduced and it is a noteworthy fact that, although our raw material inventory has been practically cut in half, we have experienced less hold-ups than ever before. The system has proved itself to be sufficiently flexible to cover any requirement of a manufacturing plant, and a change in schedule on any one or even all of the products manufactured does not cause any confusion.

One of the big factors in favor of the system is its simplicity. Even a total stranger to the plant could go out into the shop and, after a short study, point out the various parts that required attention and, if required, could make an accurate report of the standing of each department in reference to production. Another outstanding feature is its availability for use in any manufacturing plant, as it is just as adaptable to clothing, furniture, typewriters and automobiles as it is to phonographs.

American Workmen Have Best Working Conditions

More than half the persons employed in the factories of the United States are working 48 hours or less a week, and the trend toward a shorter day in industry has been more pronounced since the World War, according to a report on the legal restrictions of working hours of the National Industrial Conference Board. The board's survey covered all the states, and its original researches were used in connection with information received from the United States Census Bureau in advance of publication.

Encouragement for the belief that the American workingman is the most enlightened, as well as the best paid in the world, is given in the report, which says that the days when "the stern Puritan conscience made a virtue of working continuously from morning until night" have gone forever. Recounting the formidable opposition which first met efforts to shorten the American work-day, the board finds that now the country as a whole is strongly moved by changed ideals of thrift and leisure, and that the workers are demanding time for the pursuit of those occupations which make for the development of an intelligent citizenship.

It Pays to Make the Job Easy for the Workman

By L. C. Morrow
Managing Editor, *American Machinist*

Increasing production by decreasing the requirements for manual effort—Emphasizing the principle of making the smallest number of pieces serve the greatest variety of uses

EVERY time an employer helps his men do a job he does something for himself and his business. For himself he acquires the greater good-will of his men and for his business he increases profit. The reference is not to the man who doffs his coat and himself gets into the pushing and pulling, but to mechanical assistance, something to do the lifting, pulling and pushing for the workman, to make him master of his job, instead of controlled by the limitations of any old tool on which he can lay his hands.

Almost all of the devices mentioned in this article originated with the Lucas Machine Tool Co., of Cleveland, and all are in use in its plant today. Into the shop with the work-saving devices goes a policy of teaching the principle of *making the fewest number of pieces to serve a maximum variety of uses* — a policy of which more later.

To scrape in the column to the bed on a big horizontal boring machine requires means to lift the column to the bed and some way to move it back and forth to make the bearing marks. An overhead traveling crane does the lifting and three or four huskies *could* work the column back and forth. But they don't. A bracket, three pins and a lever with a block on one end and one man on the other do the trick. The bracket, *A*, Fig. 1, is held to the bed by cap screws. About the pin, *B*, held in the bracket, the man, moving the lever, *C*, rotates the block *D*, the forked end of which straddles the pin *E*, and by means of it causes the column to make part of a revolution around the pin *F*. Pins *E* and *F* are dropped into bolt holes of the column and *F* may be placed in any one of five holes. It is necessary, of course, that pin *F* enter the bolt hole in the bed in each position.

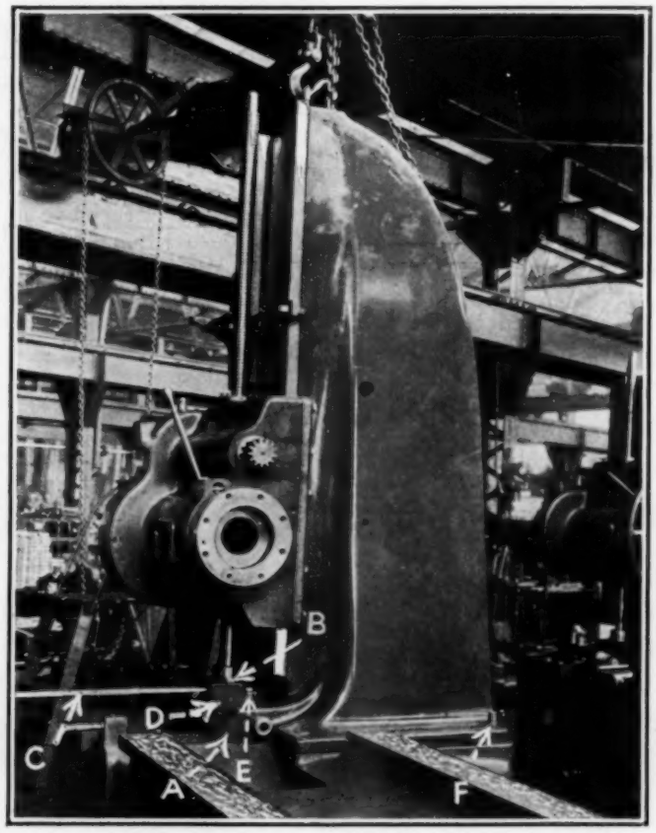
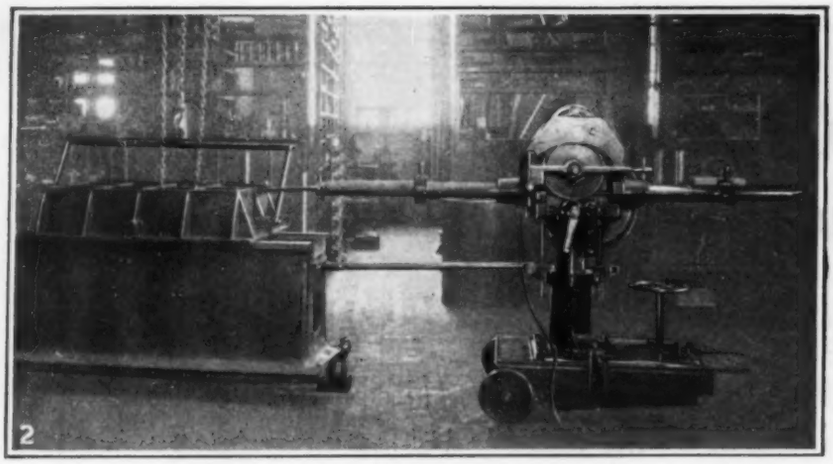


Fig. 1—Device used to rub column of boring machine on bed, when scraping in

Scraping is seldom the easiest job in the shop, and the man who does a conscientious job needs all the help he can get in lifting and pushing heavy surface plates and castings. The best condition is one where those operations are done for him, allowing the reservation of all his strength for the scraping itself. A chain block is used in handling the surface plate shown in Fig. 2, where the operation is that of scraping the bed of the boring machine, and where a separate machine does the rubbing.

The rubbing machine is, briefly, a reversing device mounted on a column, adjustable vertically and horizontally, the entire machine being portable. It is a self-contained unit, as the driving motor is a part of the machine. To secure power it is necessary only to plug in on the line. The drive is through spur gears, a friction clutch and an external gear and rack. Adjustable dogs give the required length of stroke. When working, the machine is anchored to the bed being scraped, and all weight is removed from the third, or steering wheel by means of the handwheel and screw shown.

In line with the policy of making the fewest pieces serve the maximum variety of uses, there is one handle on this machine to set the dogs, position the bar, clamp the head in place, and do every other operation where a handle or wrench is needed.



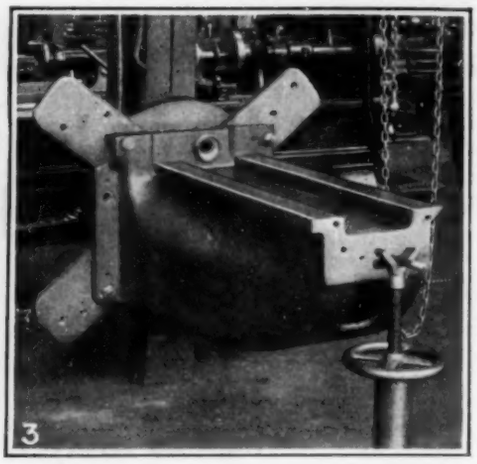


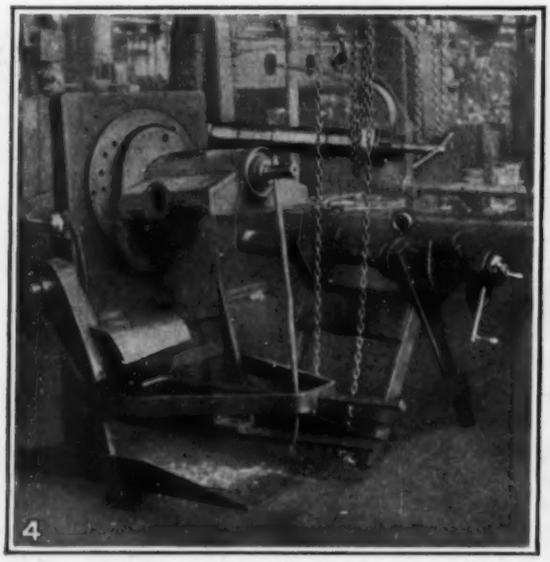
Fig. 2—Electrically driven machine for rubbing surface plate on bed. Fig. 3—Column of boring machine supported to column of shop, for scraping operation

Notice the leveling block at the end of the bed, and observe how it differs from the cast-iron wedge that is still popular in many shops. The block contains two meshing gears, one keyed to the wrench-pin shown and the other forming a nut for a second pin that bears against the underside of the bed and rises or falls as the ratchet wrench is turned.

Scraping is easiest when the surface being scraped is horizontal and in such position that the pressure of the scraper is down. Columns, therefore, as shown in Fig. 3 are mounted on a plate, which revolves on a stud carried by a bracket that is bolted to one of the shop columns. A V-block on an adjustable stand supports the top end of the column, and two rollers, near the bottom of the bracket, between it and the plate, support the column against sagging and make turning it easy. The plate is clamped to the bracket when the column is in position for scraping. After the front ways are scraped, the column is rotated to place the rear ways in position. The ever-ready chain block is used to handle the column in placing it on and removing it from the fixture.

Vises have their uses, but frequently they are made to serve purposes for which they could not have been intended, such as holding heavy castings, similar to the main box shown in Fig. 4, while they are being reamed and scraped. To one who has in that way struggled with a heavy reaming job the device illustrated will appeal. The main box is bolted to a face plate mounted on a stand that can be tipped. The plate is driven by motor through chain, worm and worm gear. The long bar, passing through the reamer shank and bearing against the bracket on the base of the machine prevents the reamer from turning with the box. When the spindle is used to show the bearing spots, the operator holds the spindle against turning. With the stand in the position shown, the front bearing is scraped. To make the scraping easier in the case of the rear bearing, which is scraped from the rear, the stand is tipped forward. By this device a better bearing is produced in a much shorter time than by older, inconvenient methods.

A facing device used to face the box square with the spindle is shown on the saw-bench at the right of the stand. Power is supplied by hand through gears. Feeding is accomplished against the reaction of a spring by turning a nut. The amount of feed may be observed on a graduated collar. Again the chain block is present, and eye-bolts are supplied to facilitate handling.



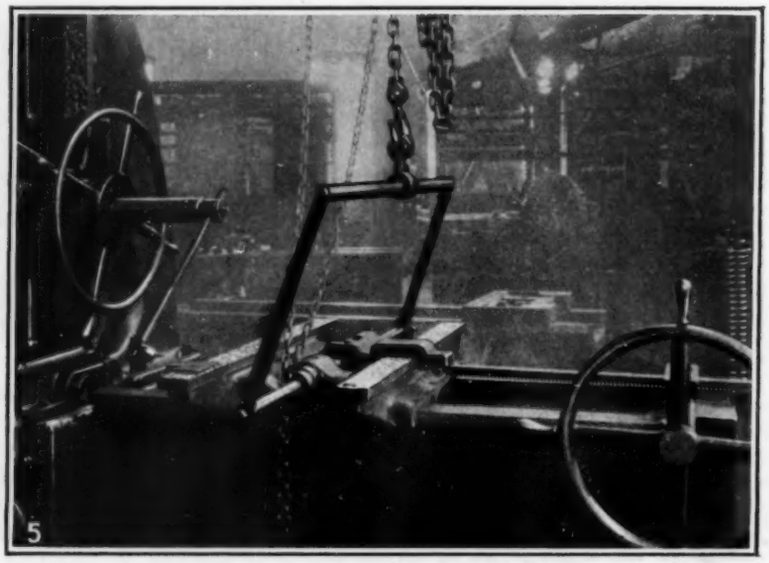


Fig. 4—Fixture and tools used in fitting spindle to main box. Fig. 5—Hand-operated device for rubbing saddle on bed, when scraping in

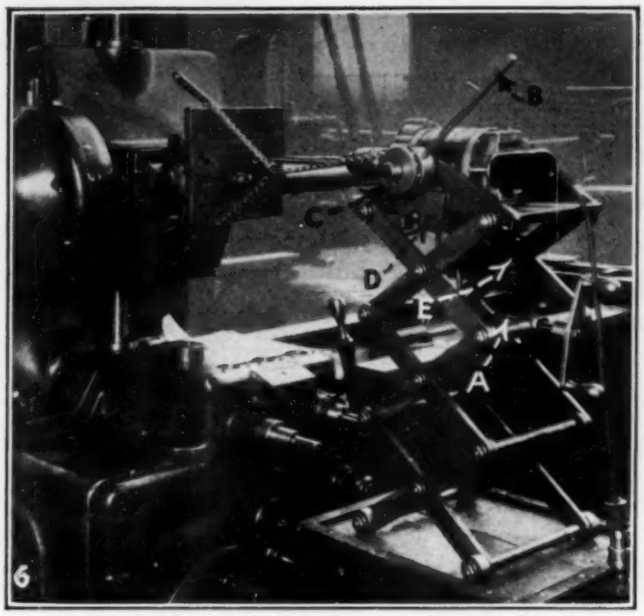
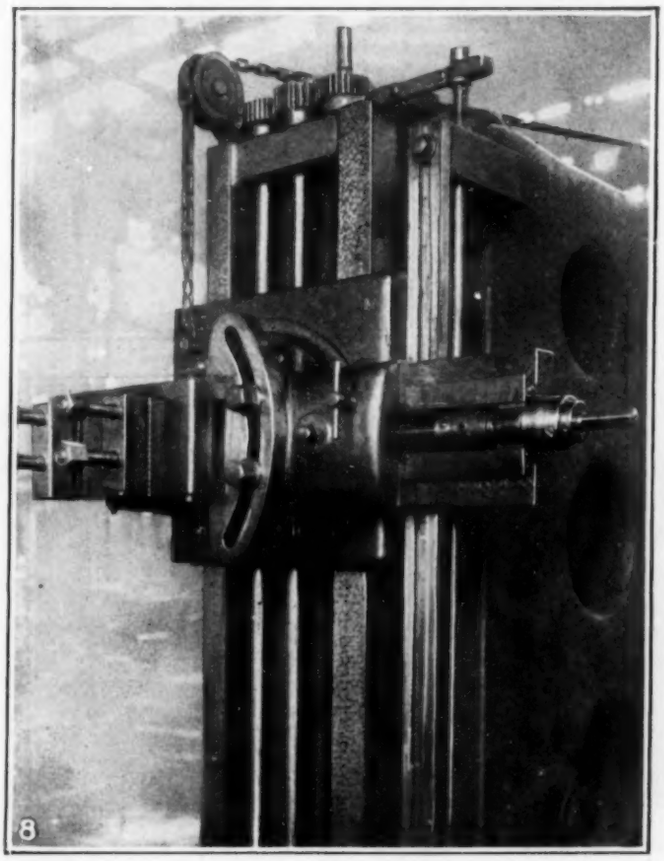


Fig. 6—Adjustable portable stand used with electric portable drill. Note feeding arrangement. Fig. 7—Adjustable portable stand used in assembly work

Among the heavier scraping jobs is that of fitting the saddle to the bed, Fig. 5. The saddle is handled by chain block and the rubbing is accomplished by means of rack and pinion and hand wheel. The pinion support is a bracket clamped to the end of the bed. A C-clamp, with set-screw, fits over one way of the saddle. The illustration shows, also, the method of supporting the indicator when aligning the saddle with the spindle. On the left-hand way of the saddle may be seen a small angle plate that is moved between the indicator and saddle-way after the indicator is brought to position. Its use eliminates the risk of changing the indicator reading that would exist if the indicator were moved into direct contact with the saddle.

In assembly, where holes must be drilled on the job, the portable electric drill finds its place. To make drill-



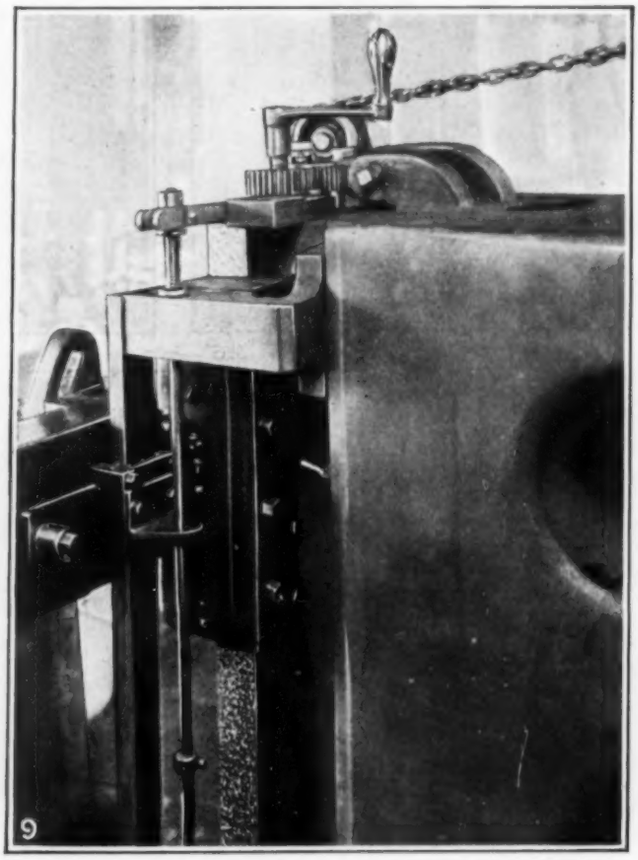


Fig. 8—Planer post equipped with form for planing bearing surfaces and relief on base of column of boring machine. Fig. 9—Rear view of same attachment

ing easy for the workman, and to insure his being able to secure and maintain alignment, and have a powerful feed, the adjustable, portable support shown in Fig. 6 was devised. Vertical adjustment is accomplished by turning the handle attached to the right and left-hand screw *A*. Feeding is done by actuating handle *B* which turns collar *C* and winds up the chain. The collar is free to turn on the handle of the electric drill, and as the drill enters the work the stand rolls forward on the floor or other support upon which it may be resting. There are two hinged blocks, one shown at *D*, which may be idle as shown, or turned up

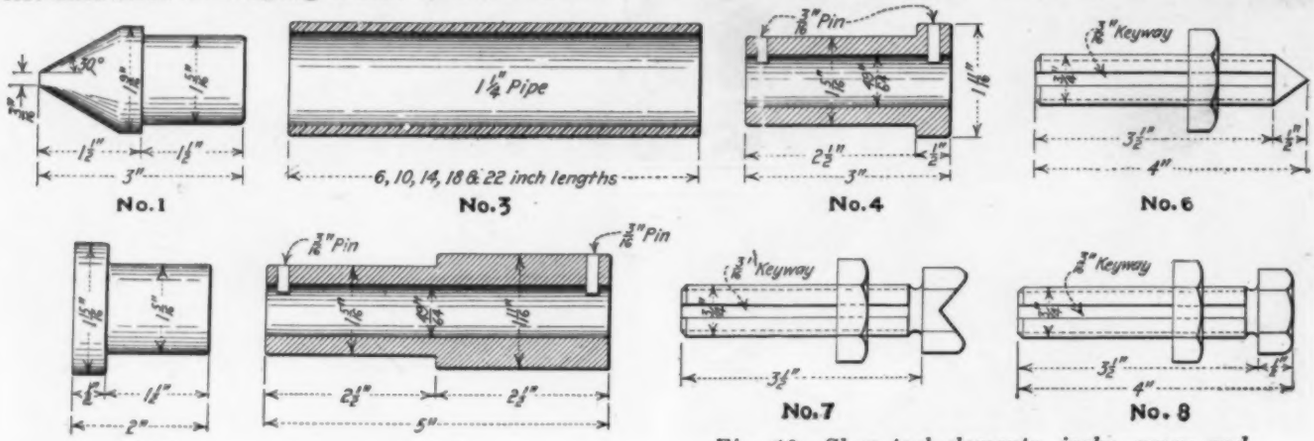
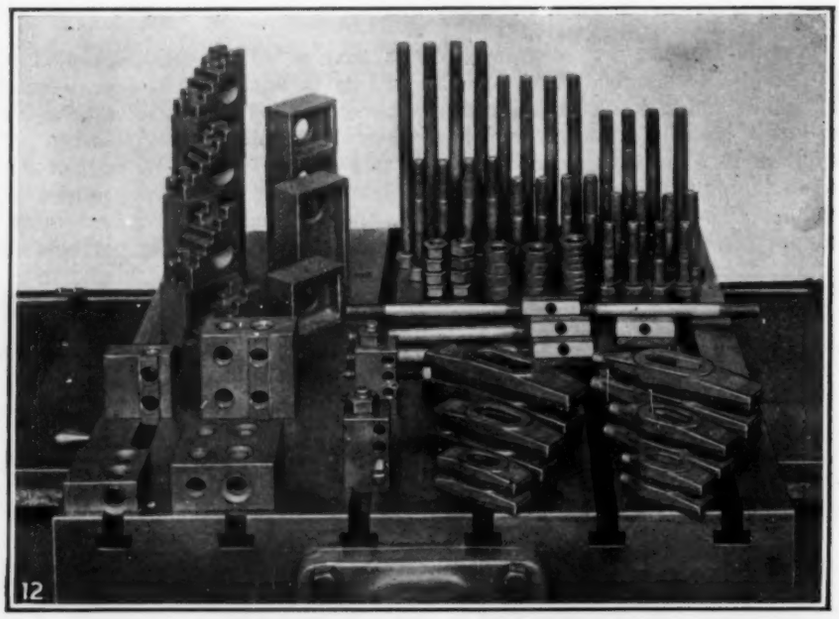
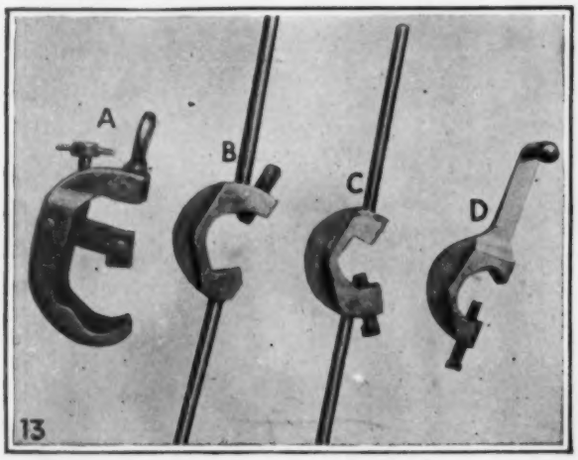


Fig. 10—Shop tool elements, jacks, props and braces for general use





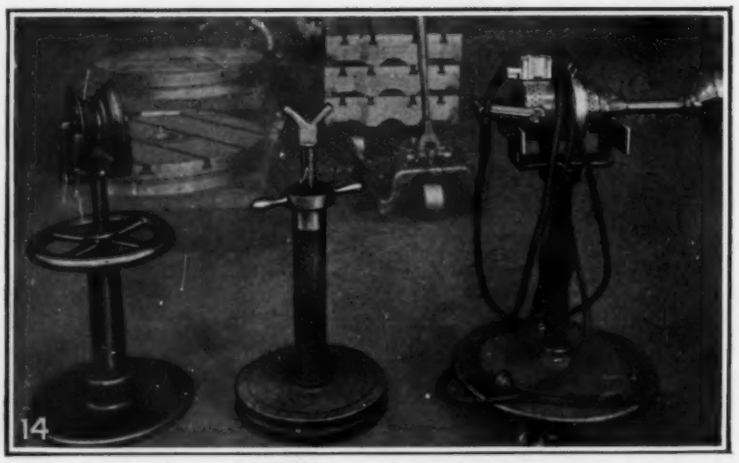
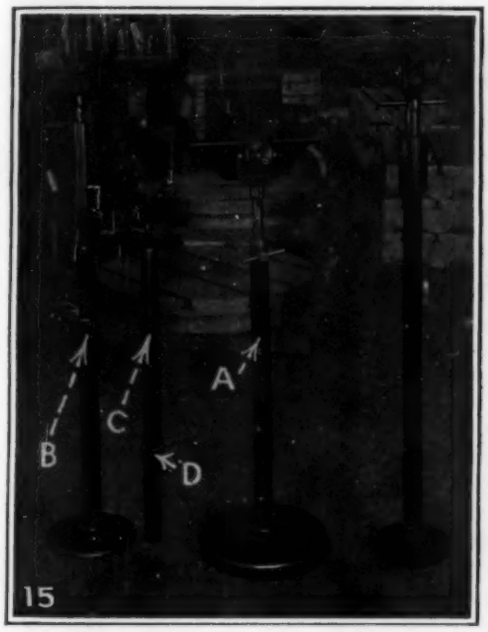
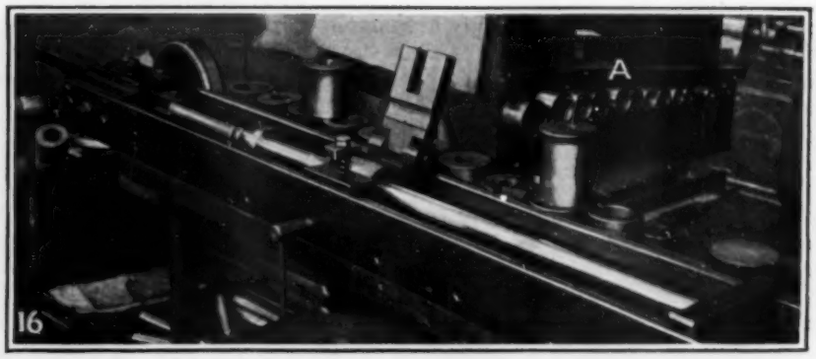


Fig. 11—Portable tool stand, equipped for setting up work on planer or milling machine. Fig. 12—Equipment designed for use on Lucas boring machines. Fig. 13—Shaft lifter and open-side dogs. Fig. 14—Work-supports and portable stand for portable electric snagging grinder





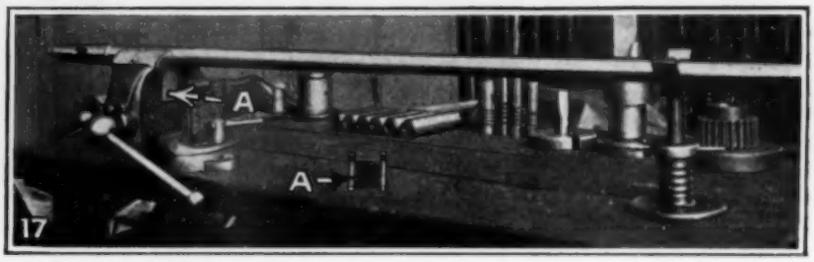


Fig. 15—Work supports. Fig. 16—Machine for pressing collars on finished shafts. Fig. 17—Adjustable V-support and vise-block

to support a portable drill of smaller size than the one in use.

The nature of the construction of the extension stand makes elevation from the lowest position difficult. Hence the springs *E* are provided. From a point a few inches above the lowest position to the lowest position, the springs are being compressed, because the plate attached to the lower end of the springs strikes the center rod of the stand. The energy stored in the compression is, of course, available to assist in extending the stand.

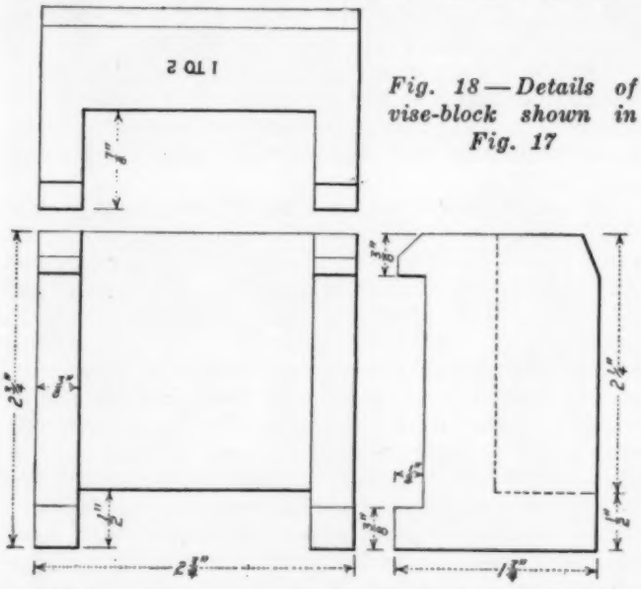


Fig. 18—Details of vise-block shown in Fig. 17

A similar stand, Fig. 7, is shown supporting the back rest, in the assembly of the tail column. The possibility of one man's supporting the back rest and applying the cap is out of the question, unless he takes the trouble to build up a pile of blocks as a support. Another use of the adjustable V-support is seen also.

All of the examples given have been those of devices for facilitating fitting and assembly. In Figs. 8 and 9 is shown an attachment for use in a planing operation. Certain portions of the base of the column of the boring machine are relieved, as there is no necessity of having the entire base scraped to the bed. The relief and bearing surfaces are planed at one setting, using the down feed of a side head mounted on an auxiliary post bolted to a base in the floor and placed about midway of the front portion of the planer bed. A roller, attached to the slide of the planer head, follows the form shown in Fig. 8. The rear view, Fig. 9, shows the construction, and the adjustable dog by which the feed is automatically stopped at the completion of the cut. By the arrangement described the base of the column is machined on a planer comparatively narrow between housings, and since no other job in the shop requires a wide planer, the advantages are obvious.

Assistance at Machines

The relieving job is pointed less at aiding the operator than at performing economically an operation that might be made very expensive. Nevertheless the machinist on this and every other planing job has at his machine all the bolts, jacks, props, braces, collars, washers, and similar setting-up tools that he needs. In Fig. 10 are shown the eight elements provided for planer set-up. A study of the possibilities of these elements in combination will show that they will suffice for any but the most extreme job, where jacks, props and braces are required.

Bolts, nuts, clamps, washers, stops and other tools are provided on the portable stand shown in Fig. 11. Note that one of these stands, with all equipment necessary, is supplied for each machine where set-up work is performed. The stand is arranged to carry in addition the cutting tools for the job, wrenches, measuring tools, and other necessities.

In making up tools for machine operation, the principle of making the fewest number of pieces to serve the maximum variety of uses has been adhered to. The same principle has been followed in a set of equipment that the company can provide for its own product, as

shown in Fig. 12. The elements are supplied in twos or multiples of two, and the combinations possible are almost numberless. For example, each of the blocks shown in the front, left-hand corner, may be placed in four positions on account of the offset keys, and the holes permit clamping through the blocks in any position. On this equipment, and on that shown in Fig. 11 as well, collars and holes are dished, nuts are rounded, and the first thread of all bolts is removed. Bolts are stamped to show their length.

Another convenience is the two-part block for the slots of planer and milling machine tables. The mating sides of the two parts are male and female Vs and a hollow-head set screw is provided to separate them to make them tight in the slots. Burring of slots and blocks is not necessary, neither is hammering to get them in and using a pinch bar to get them out.

In Fig. 13 at *A* is shown a shaft lifter. When used on finished shafts, the jaws are lined by copper or leather. At *B*, *C* and *D* are shown open-side dogs used to turn or to hold shafts that are in such position as to render impossible the application of a dog over the end of the shaft.

Convenient Stands

The stands shown in Figs. 14 and 15 are put to a variety of uses that will be apparent. Stand *A*, Fig. 15, generally used in connection with a drill press, will support either round or flat stock. The rod in stand *B* is made as shown at *C* with a collar *D*, so that two heights may be obtained. Rods of other lengths are provided to fit the same stand.

There is a refinement in providing for the workmen such devices as those shown in Figs. 16 and 17. The machine shown in Fig. 16 is used in pressing collars onto shafts. The shaft is supported on bushings and the plunger is operated through rack and pinion for fast feed or through pinion and internal gear for slow feed. In either case the movement of the handle and the rotation of the internal gear are right-hand, that is, in the direction of travel of the rack.

The adjustable V-support shown in Fig. 17 needs no explanation. Its cost is slight and its worth in saving money and tranquility of mind great.

The vise-block *A*, shown in Fig. 17, and detailed in Fig. 18, is one of a number of small helps that in their way are quite as important as the fixtures and machines. Due to its construction it may be placed in several positions in the vise to give as many levels on which work of a variety of sizes may be supported.

Notice, in Fig. 17, the grooves in the column of the adjustable V-support. They are there to make handling easy. Notice the same provision on the babbitt chunk in Fig. 11, and pin *F* in Fig. 1. A smooth pin or babbitt block will slide through a greasy hand, but the grooved pin and block will not.

Protecting Finished Surfaces

It is sometimes necessary, in a lathe, to use a dog on a finished surface, and even with the best of care an ordinary dog with a piece or two of copper to protect the work is not entirely satisfactory. Split tempered bushings finished on the inside to fit the shaft, such as shown at *A*, Fig. 16, permit the use of a dog without copper strips and leave no scratches or burrs on the shafts. The bushing is slipped on the shaft and the dog is put on over the bushing. The setscrews may be tightened as much as necessary.

Along with the consideration for the workmen, expressed in the tools that have been described, there is a decent respect for "center of gravity." Holes and lugs for hooks have been provided on the castings going to make up the product of the company, so that in handling them by crane there is one way, and one way only, to hook up most of the castings. Experimenting, hunting for auxiliary chains, slings and blocks, tipping of castings, lost time and accidents are minimized.

Providing the mechanical aids told about is within the province of any manufacturer. Were the only result that of making the job easy for the workman, their construction and use would be justified. But put aside the altruistic motive, and consider them only from the money-saving point of view. They save money, in the man's time, the machine time and the customer's time. The effect of their use is, also, cumulative, in that they promote the principle of making the fewest pieces serve a maximum variety of uses, and as a consequence the fewest motions or the fewest operations accomplish the greatest amount of production.

Improvements in Locomotives

(From Research Narrative No. 82, published by Engineering Foundation.)

More locomotive improvements are in sight. Several relatively new ones are ready for general application. The steam locomotive has not reached its limit of capacity, power or efficiency. Today's problem for the locomotive designer is the co-ordination of improvements and their carefully balanced incorporation into the rolling power plant. Whenever this is done the locomotive takes a remarkable step forward.

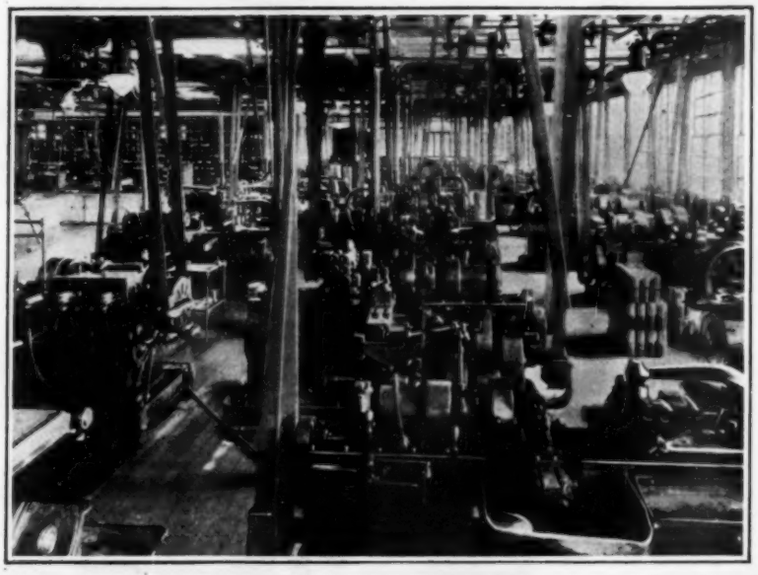
Some items for co-ordination are: general design of locomotive, especially of boilers; superheater, with superheated steam for all auxiliaries; brick arch in fireboxes and other firebox improvements; thermic syphon, providing re-entrant firebox heating surface; booster; mechanical stoker; feed-water heater; economical steam expansion; higher steam pressures; track relief improvements; factors that make for greater serviceability.

By aid of these improvements you may have greater drawbar pull at the same speed or greater speed for the same drawbar pull, with no increase in fuel consumption. At 30 miles per hour two improved locomotives will pull as much as three plain ones. At speeds above 12 to 15 miles per hour the boiler pulls the train. Mechanical stoker improvements contribute increased power per unit of fuel fired. Higher steam pressures are coming rapidly. One railroad is operating 598 locomotives with economical steam expansion in heavy freight service. Between 20 and 25 per cent of the fuel is saved. This is a wonderfully promsing development.

The booster is a supplementary engine with small cylinders applicable to the trailing wheels of any locomotive that has trailers. It is used in starting and at slow speeds, and cuts out automatically when the speed of the locomotive reaches about 15 miles an hour. Its operation is similar to the low gear of an automobile. It may be cut in at low speeds in order to get over a heavy grade which might be too steep for the main engine alone to negotiate.

One locomotive builder is advocating three cylinder engines for heavy freight service. Service results will soon provide means for determining the value of this plan as compared with contemporary improvements.

PUBLIC LIBRARY
DETROIT MICH.

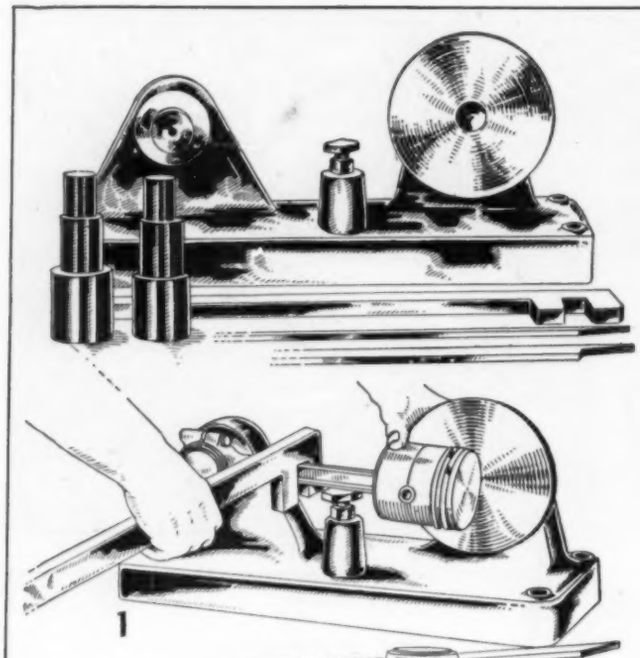


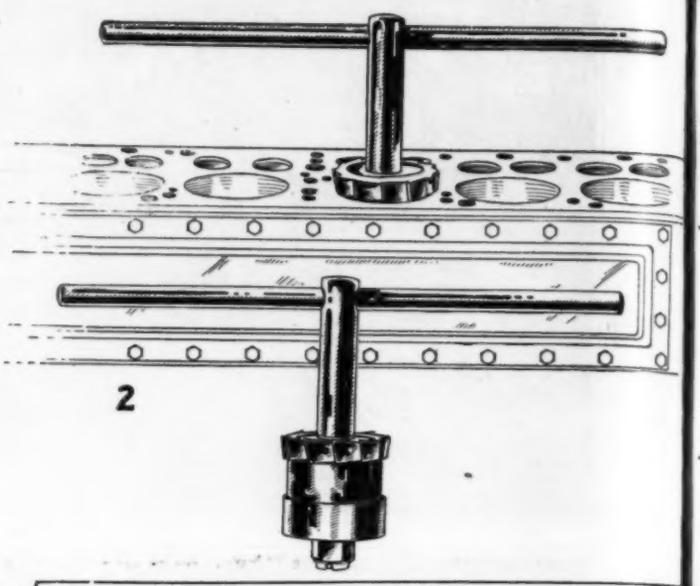
Where Machine Tools Are Made

Potter & Johnston Machine Company

Pawtucket, R. I.

Established 1898





Packard Pointers

Fig. 1—Connecting rod aligning fixture

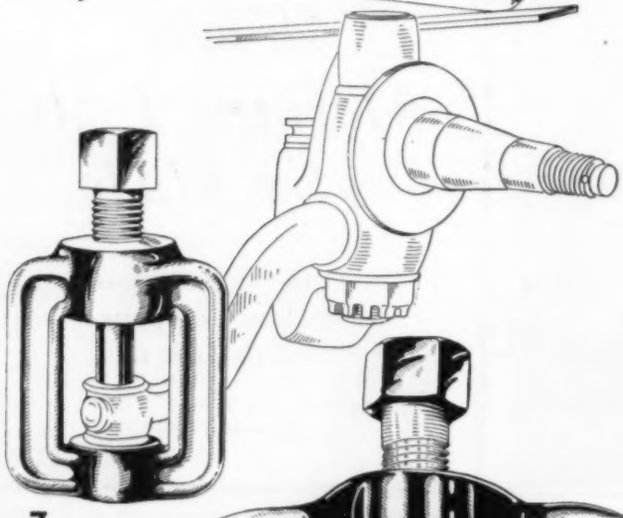
Fig. 2—Tool for chamfering cylinders

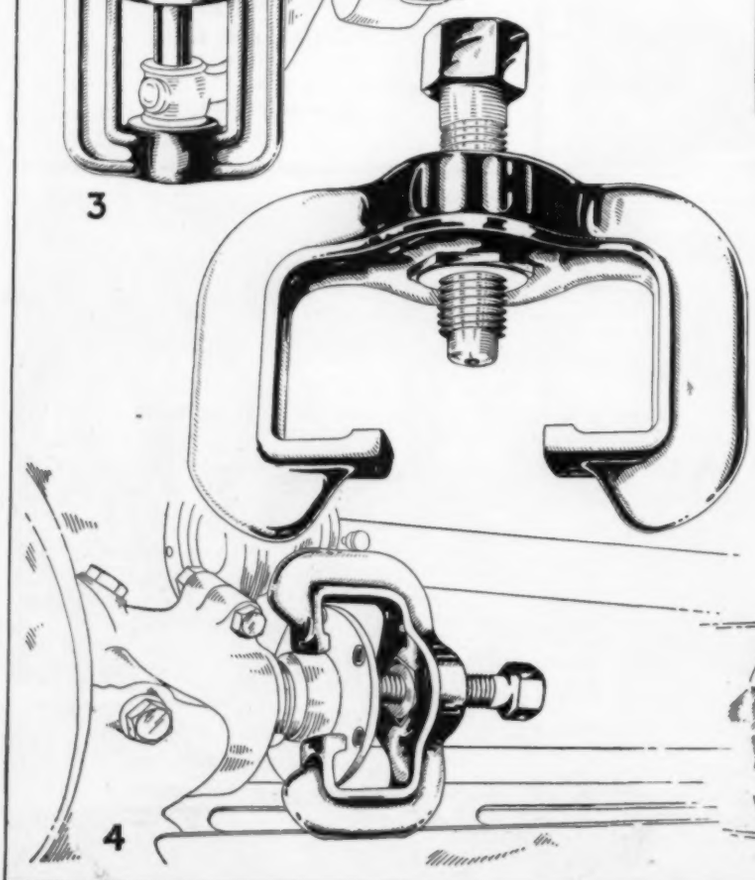
Fig. 3—Removing bushing from steering knuckle

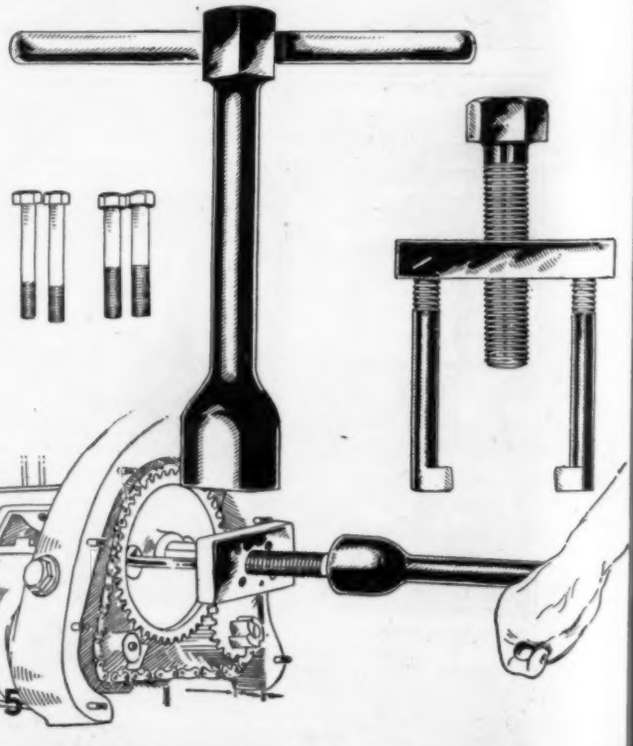
Fig. 4—Pulling flange of universal joint

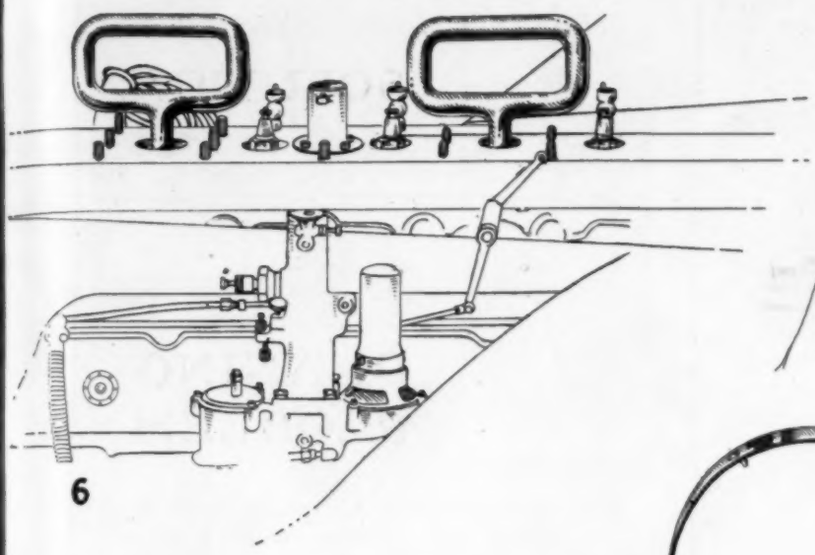
Fig. 5—Pulley and sprocket puller

Fig. 6—Cylinder head lifters screw in spark plug holes

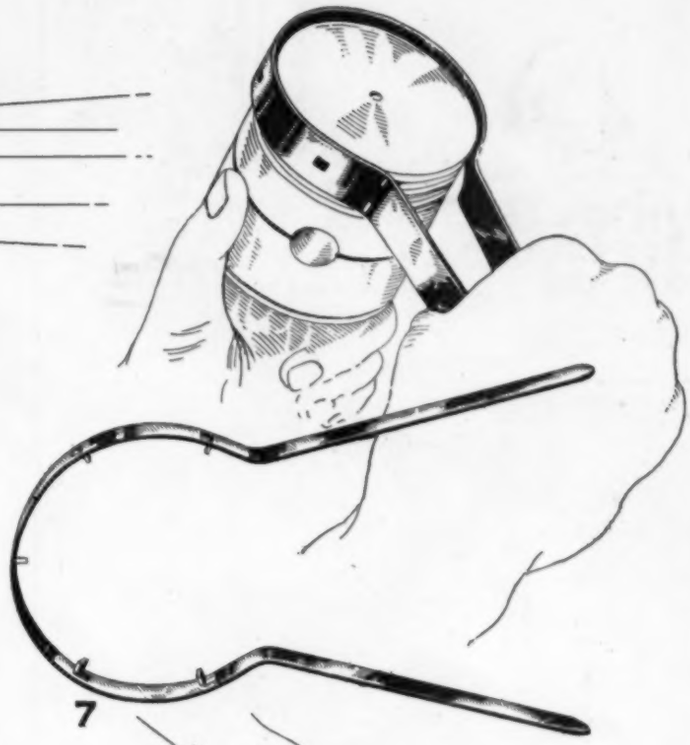








6



7

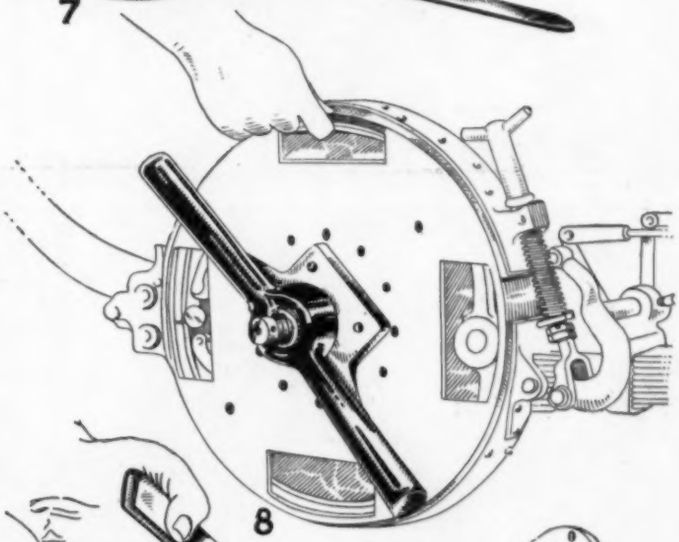
for Service Stations

Fig. 7—Tool for cutting carbon out of piston grooves

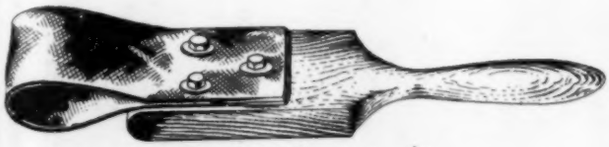
Fig. 8—Brake drum with dummy hub for testing brake bands

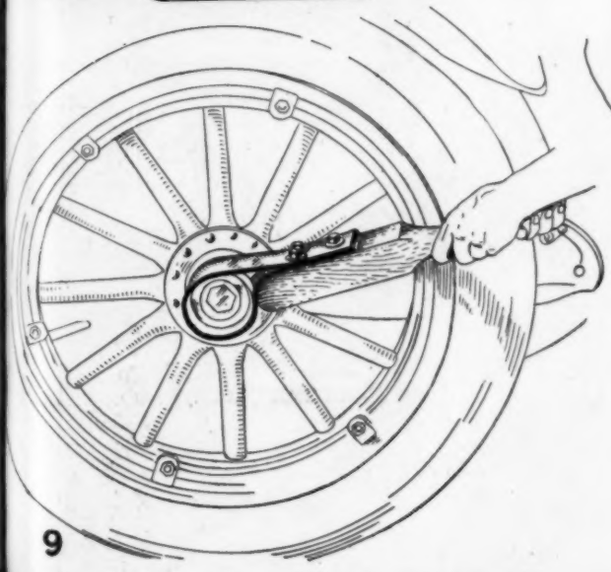
Fig. 9—Rubberized canvas hub cap wrench

Fig. 10—Tool for compressing clutch springs

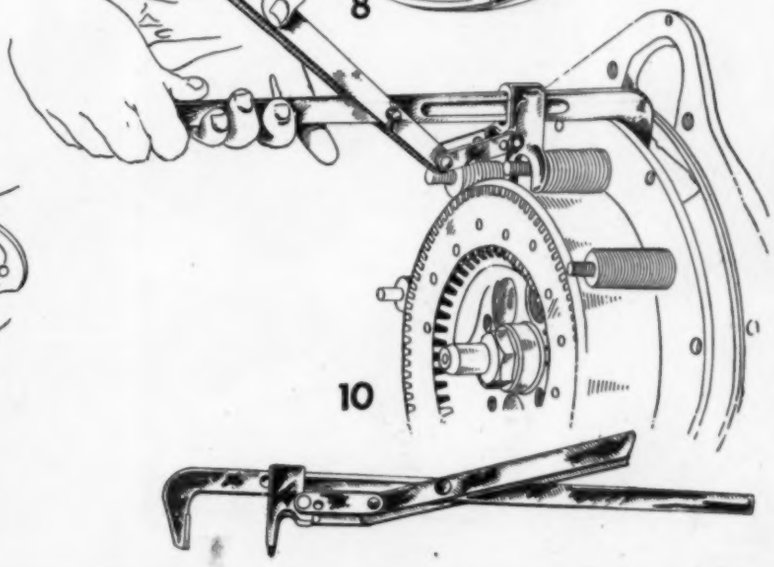


8

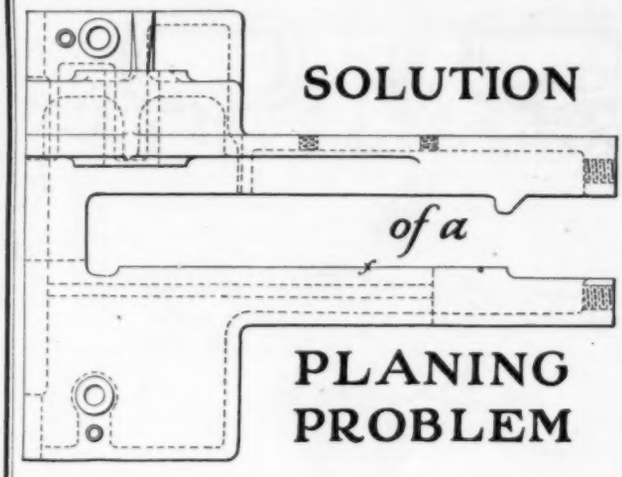




9

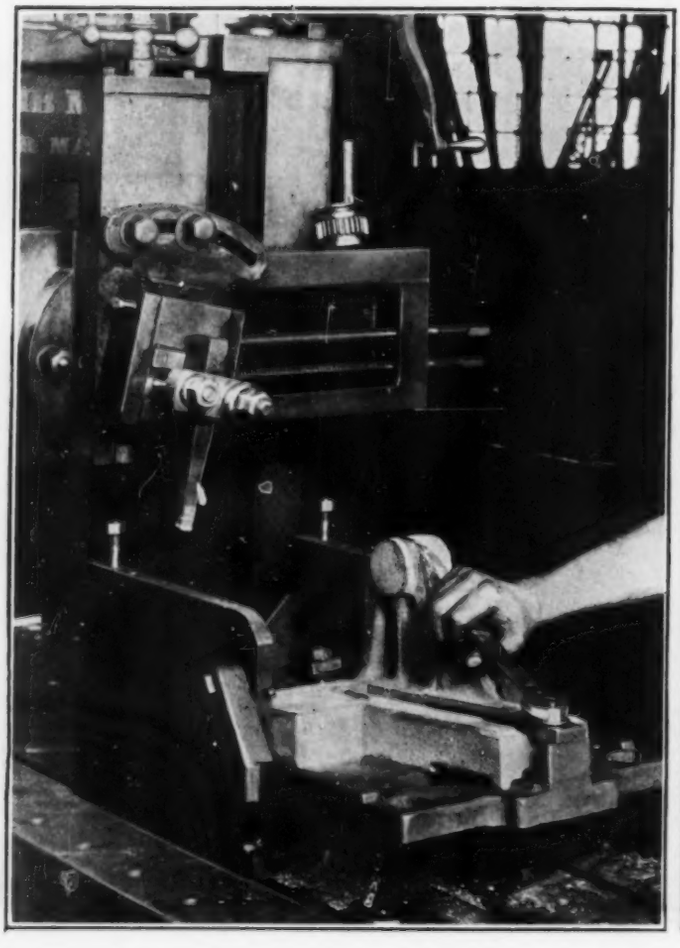


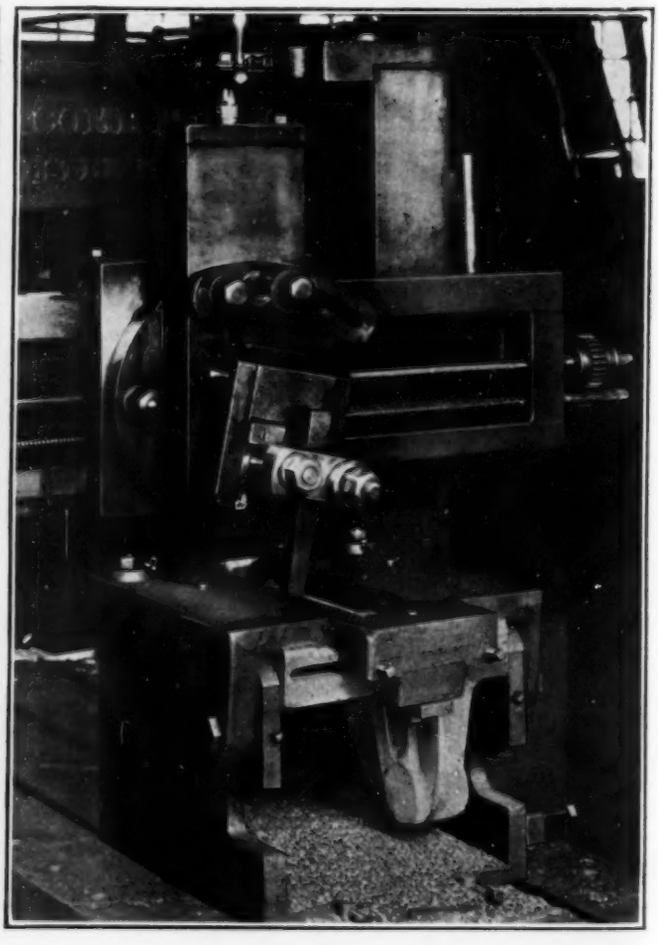
10



SOLUTION *of a* PLANING PROBLEM

The side frame of an Advance Lever Cutter has to have the planing knife bearing, marked *f* above, accurately planed. At first this was done as shown at the left with a 16-in. tool. Chipping off on the finished side and possible injury to the operator's hand were the objections. They were overcome by the use of the fixture shown below which permitted the use of a much shorter tool by bringing the surface to be planed nearer to the tool block. We are indebted to Edward Moberg, of the Challenge Machinery Co., for the photographs and details.





Trolley Wire in the Making

By Jack Williams

Metal of special composition—Casting and turning the bars—Rolling the bars into rods—Joining the coils by brazing—Drawing the wire in lengths of one mile

THE problem of making wire of sufficient conductivity to carry the electrical load safely and at the same time strong enough physically to sustain the tension due to its weight augmented by the weight of ice was not solved all at once, nor, indeed, has it yet been worked out to an entirely satisfactory conclusion; yet so well and so carefully have the requirements been

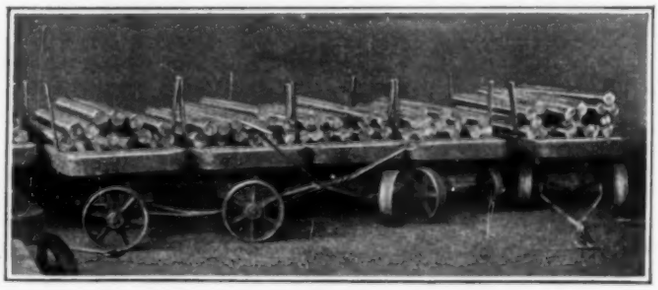


Fig. 1.—Turned bars, ready for rolling

studied and the conditions provided for that a "down" wire in a city street is a rare occurrence.

This article is intended to describe some of the processes through which the metal passes in its progress from the melting furnace to the smooth, hard-surfaced wire, ready to be stretched over the car track. The illustrations, taken from the mills of the Bridgeport Brass Co., are not "staged," but with the single exception of the rolling mills were all made while the work was in progress.

The development of an alloy that combines the requisite electrical conductivity with the necessary physical strength is a job for the metallurgical laboratory. The material used by the above company is compounded in its own mills and is marketed under the trade name of "Phono-Electric." It is neither brass nor copper, but is an alloy that lies somewhere between these metals, with other ingredients incorporated into the mixture to give it the requisite properties.

The compound is melted in electric furnaces and poured into iron molds, from which it emerges in the form of round bars about 5 in. in diameter and weighing approximately 250 lb. each. The bars go first to a lathe, where the outer surface is turned off to remove the scale and any slight imperfections that may have developed in the cooling. As the surface of the bar, smoothed and burnished by its passage through mill rolls and drawing dies, remains the surface of the finished wire, it is essential that all imperfections be removed before the reducing process begins.

In Fig. 1 may be seen a number of the turned bars ready to go to the rolls, shown in Fig. 2, in which the first reduction takes place. The bars are heated in oil-fired furnaces to the required working temperature and as each is taken from the furnace it is passed successively through the series of grooves to be seen in the first set of rolls, gradually reducing in diameter and increasing in length as it approaches the smaller grooves at the further end of the rolls.

As soon as it is delivered from the last pass it is carried to the adjoining "3-high" roll train where the reducing process is continued. Instead of the intermittent rolling and passing back over the top of the rolls, necessarily pursued in the first set of rolls, the rolling is now continuous; as the rod is small enough in diameter and still retains a sufficient degree of heat to be quite flexible. As it comes through between the middle and lower rolls on its first pass the operator seizes the end in tongs and, with a dexterous sweep of his arm, throws it into a loop and passes the end back between the middle and upper rolls of the train.

This movement is repeated, first on one side of the mill and then on the other, until the rod may be passing through the rolls in several places at the same time, with a corresponding number of loops gradually receding from the mill on each side. The reason for the recession of the loops is that, owing to the constantly lessening diameter and increasing length of the rod under the action of the rolls, it is emerging from one

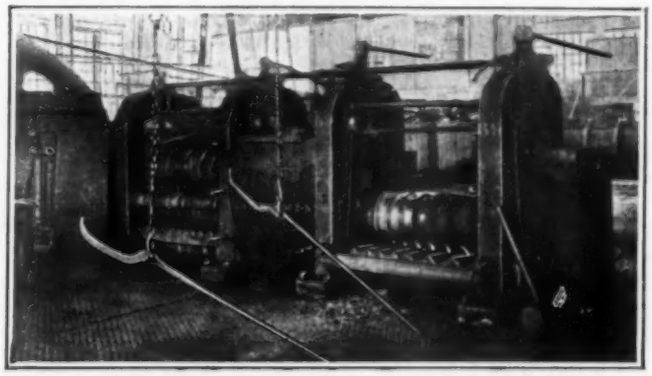


Fig. 2.—Mills in which the first reduction takes place

groove at a faster rate than it is being drawn in to the succeeding groove.

Having completed its final passage through the rolls within a very short time after its first appearance from the furnace, the erstwhile bar of metal is wound, while still almost red-hot, into coils of convenient size for handling.

When next we see the coils they are in the wire mill, being prepared for further reduction in size by the process of drawing. Both ends of each coil are sawed off in a diagonal cut, and one end, being left several inches in length, is tagged with an identifiying symbol and sent to the laboratory to be tested. Upon receipt from the laboratory of a favorable report on the properties of the metal of which they are composed, the coils are then brazed together.

The brazing outfit, shown in Figs. 3 and 4, is very simple. It consists of two bench vises fastened firmly

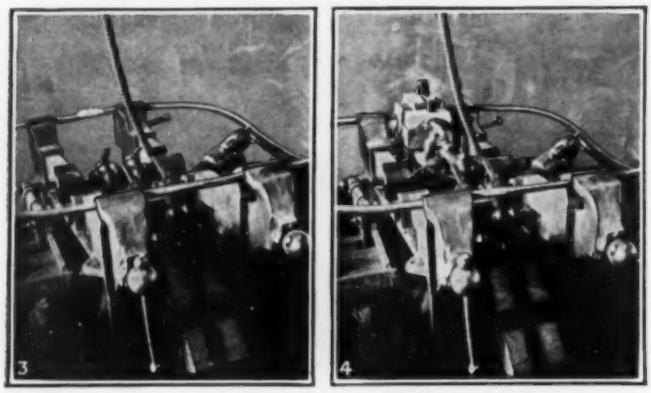


Fig. 3.—A joint prepared for brazing. Fig. 4.—In the brazing furnace

to one bench at a suitable distance apart; and a small furnace with proper air and gas connections. The furnace is hinged to the bench between the vises so that it may be lifted up and latched in position to enclose the joint or dropped down out of the way of the operator as he prepares the joint to be brazed.

Both of the latter figures show two complete outfits, the one nearest the observer in each case having a brazed joint between the respective vises. In Fig. 3 a joint has been prepared for brazing, and in Fig. 4 the furnace has been raised and latched in position to be fired. The top of the furnace is merely a loose slab of fire-brick, clamped by a metal band for convenience of the operator in handling it.

Brazing Details

In getting ready for the brazing operation one coil of the rod is wound onto a large power-driven reel adjoining the brazing bench and another is allowed to lie on the floor on the opposite side. A sufficient length from each coil is clamped in the respective vises with the scarfed surfaces adjacent. It is not the easiest matter in the world to make the two scarfed surfaces lie closely together but the operator, by dint of twisting one or other of the wires in the vise by means of a Stillson wrench and by hammering the ends, persuades them to do so. Springing the faces slightly apart, he introduces a thin strip of special brazing metal between them and then binds the whole firmly together by wrapping a layer or two of copper wire tightly over the length of the joint.

In four or five minutes after lighting the gas the brazing is completed and the operator then lowers the furnace out of his way and proceeds to dress up the newly made joint with a coarse file. Power is then applied to the reel and the newly-joined coil wound upon it until the other end is reached and is in position to be clamped in the vise to repeat the operation.

The machinery for drawing the wire, shown in Fig. 5, consists of a heavy frame bolted securely to a substantial foundation, which frame carries a short shaft upon the end of which is mounted a steel drum having a disconnecting clutch in its interior. Between the bearings a large spur gear (concealed by the wooden guard in the illustration) is keyed to the shaft and derives its power from a motor through a speed-reduction gear train. In line with and on a level with the upper part of the periphery of the drum a drawing die is held in a bracket that is a part of the frame.

The Drawing Operation

The reel containing the large diameter rod that has just been brazed into a continuous length is mounted to the left of the drawing die and in line with it. A few inches of the rod have been reduced by swaging to a diameter that will allow it to be passed through the drawing die, and the end is caught under the eccentric clamp at the end of the drum; after which the clutch is engaged and the wire drawn through the die until the drum is nearly full.

The clamp is then released by striking a blow upon the end of the handle, and the drawing instantly stops, though the drum continues to revolve. All but three or four turns of the wire are then slipped off the drum and the free end is carried and attached to the reel. The drawing is thenceforward controlled by the clutch lever at the reel; for so long as the latter maintains the tension upon the wire the drum will continue to pull it through the die, but if the tension is released by stopping the reel, the few remaining turns of wire on the drum will slacken and allow the drum to rotate idly within them.

As the newly drawn wire is laid on the drum in the form of a helix it would soon run off the inner edge except for the bevelled flange. The extreme tension upon the wire, due to the strain of drawing, causes the incoming strand to be crowded down between the bevelled flange and the adjacent turn of wire and is

Fig. 5.—Drawing the wire to finished size

thus constantly pushing the turns toward the outer edge of the drum.

The wire is subjected to a varying number of draws as the case may require, to reduce it from the product of the rolling mill to the diameters specified by the consumers; each draw being an exact repetition of the process here described except for the substitution of a drawing die of the corresponding size. In brazing the rods together the length is so calculated as to make each reel of finished wire on mile long.

Solenoid Load Brakes for Crane Hoist Motors

By H. H. Vernon
General Electric Co.

PRACTICALLY all crane hoists require an automatic brake of some kind in order to prevent excessively high speeds in the lowering direction. Before the solenoid load brake was put on the market nearly all cranes using alternating current power were equipped with automatic mechanical load brakes. An automatic mechanical load brake is ineffective in the hoisting direction but in the lowering direction, as its name implies, puts a load on the motor so that power is required to lower a light or loaded hook as well as to hoist a load. As the mechanical load brake is a device that depends on friction for its effectiveness, it requires more or less attention for adjustments, but a solenoid load brake having automatic adjustment for shoe wear requires very little attention.

Solenoid Load Brake Saves Weight and Space

The solenoid load brake replaces the automatic mechanical load brake and also takes the place of the solenoid holding brake, thus saving weight and space on the crane trolley as it is mounted on the motor and is only slightly larger than a standard solenoid brake.

These brakes have been used on cranes in foundries, machine shops, annealing shops, fabricating shops, shipping departments, ship yards, power houses, cement mills and on hoists handling heavy logs in the woods. The hook speeds of the hoists on which they have been used vary from 15 to 200 ft. per min., thus showing a wide speed range for different applications. The motor sizes range from 5- to 100-hp. and run at 900 revolutions per minute.

Although solenoid load brakes have been in use for five years, they are sometimes improperly referred to as "two-torque brakes." A two-torque brake is one that has two degrees of braking, while a solenoid load brake has an infinite number of braking torques, which means a definite lowering speed for every load. A multiple magnet brake using two solenoids is a two-torque brake because it gives one braking torque when the core of one solenoid is down (coil de-energized) and another braking torque when the cores of both solenoids are down (all coils de-energized). When three solenoids are used, it is a three- or four-torque brake.

Electrical Connections

A solenoid load brake is similar in construction to the standard a.c. solenoid brake but differs from it in that two solenoids are used. One solenoid is connected across one phase of the primary winding of the motor the same as the commonly used solenoid brake, and the other solenoid is connected across one phase of the rotor winding with part of the starting resistor in series with it. This latter is known as the floating solenoid, and the one connected across the primary winding is called the connected solenoid.

The braking effect due to the floating solenoid is about 90 per cent of the full-load running torque of the motor, and that due to the connected solenoid is about 35 per cent of the full-load running torque. The resistor used for accelerating and speed control is laid out for 25 per cent full-load running torque of the motor at standstill, and it is the combination of the motor and brake torques that gives the speed control of the crane hoist hook.

When power is applied to the motor by turning the controller to the first point, the motor acts as a transformer and a voltage is induced in the rotor. As the coil of the floating solenoid is connected across one phase of the rotor winding, the core tends to raise. This partially releases the brake shoes and if the torque exerted by the load on the hook plus the torque of the motor is sufficient to overcome the friction of the hoist plus the braking torque of the brake, the hook starts down and the speed depends on the weight of the hook load. The connected solenoid is not energized on the first point of the controller and exerts a braking effect, to which is added the braking torque of the floating solenoid as the rotor revolves. The voltage on the rotor winding decreases as the rotor speed increases and the core of the floating solenoid tends to drop. This increases the braking effect of the solenoid load brake and when a balance is reached between the rotor voltage and the retarding torque of the brake, the motor lowers the load at a definite speed. If the load is not heavy enough to overhaul the motor, it does not start and the controller must be turned to the second point.

The second point of the controller allows a starting torque of 50 per cent full load motor torque and in most cases this, combined with the braking torque, is sufficient to lower a light hook. The third and fourth points of the drum controller give higher starting torques on the motor and, therefore, higher speeds at different loads. The lowest speeds with the brake effective are obtained on the first point, and the highest on the fourth point. The fifth point of the controller energizes the connected solenoid and the brake is entirely released, that is, it acts as a standard solenoid brake.

Regenerative Braking by the Motor

The fifth, sixth and remaining points of the controller allow the motor to run as an induction generator if overhauled by the load and under such conditions power is returned to the power supply system. With an overhauling load, the highest regenerative braking speed (solenoid load brake entirely released) is obtained on the fifth point and the slowest regenerative speed on the last point. The latter is practically the same as the full load hoisting speed.

It has been proven that some cranes need neither a solenoid load brake nor an automatic mechanical load brake for successful operation. For instance, small short-lift slow-speed cranes handling material that does not require a landing speed slower than normal hoisting speed, or material that is not easily broken or damaged. For such cranes, a standard solenoid brake is all that is necessary.

In foundries and machine shops where creeping speeds and very small movements of the crane hook are necessary, solenoid load brakes allow very successful operation. Creeping speeds may be obtained on the first hoisting point of the controller by inserting resistance in series with the coil of the connected solenoid. When the motor is energized, the core of the floating solenoid tends to raise the same as on the first controller point in the lowering direction and the core of the connected solenoid also tends to raise due to the current passing through its coil and the series resistance. The movement of the core of both solenoids is so small that the brake shoes do not leave the face of the wheel and therefore, an artificial load is produced that allows the

rotor to revolve at a low speed with a light load on the hook. As the shoes do not leave the brake wheel the motor can be jogged to about $\frac{1}{10}$ of a revolution of the rotor which, on a crane geared for 30 ft. per min. hook speed with a 1,200-r.p.m. motor is equivalent to about a $\frac{1}{4}$-in. movement of the hook.

Drum controllers have been developed to allow creeping speeds on the first hoisting point, and a line contactor and limit switch can be used to limit the hook travel in the hoisting direction. When the limit switch opens the line contactor, the hook cannot be hoisted any further but it can be lowered by turning the controller cylinder to reverse the motor. No backing out switch or other auxiliaries are required to lower the hook after the limit switch has operated.

Multiple Drilling and Tapping Machine Offered to the Trade

THE MACHINE described here was designed and built by the Johnson Service Co., Milwaukee, Wis., for use in drilling and tapping three radial holes, 120 deg. apart, in the barrel of the casting shown in Fig. 1. The machine is a success in every way and because the Johnson Service Co. believe that such a machine could be made use of by other institutions with

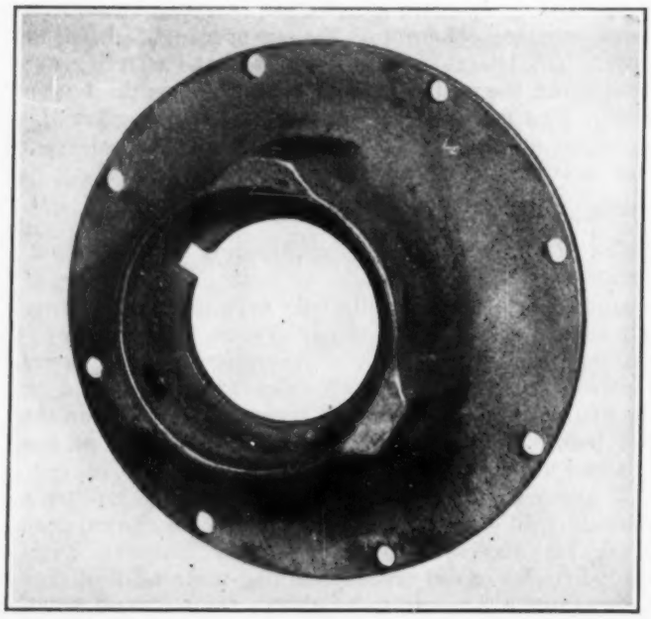


Fig. 1—Part for which the machine was designed

similar problems, a set of drawings is offered, gratis, to anyone who wishes to build the machine.

The machine is of the vertical type of construction and the working parts consist primarily of six spindles arranged at equidistant points on a round plate, the operating ends of the spindles pointing toward the center of the plate. Three of the spindles carry drills and the other three carry $\frac{3}{8}$-in. taps, the drill and tap spindles alternating. The work-arbor projects through the axis of the plate, and the piece is clamped in position by means of the hand knob *A*, which can be seen on the end of the work-arbor in Fig. 2. A jig carrying three bushings, set in line with the drills,

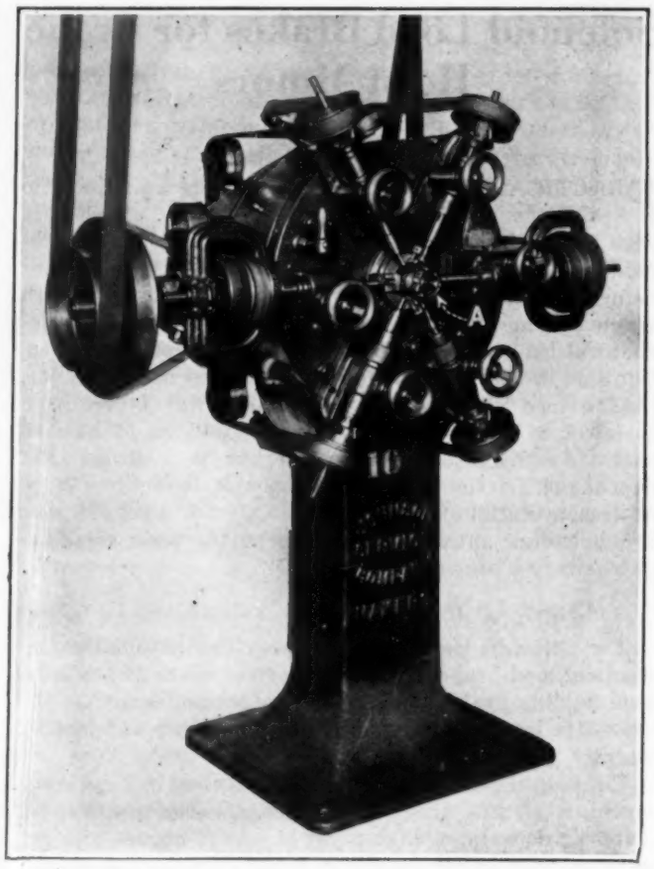


Fig. 2—Multiple drilling and tapping machine designed by the Johnson Service Co., Milwaukee, Wis.

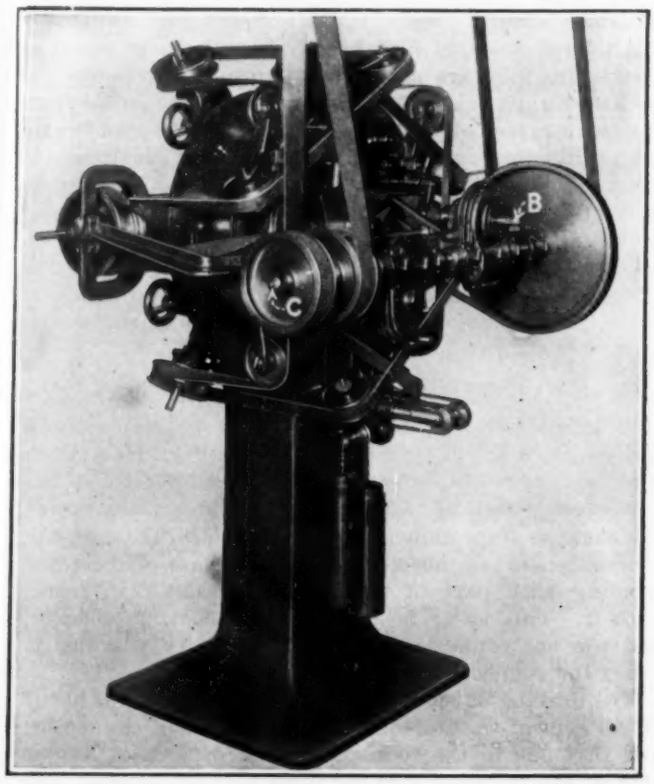


Fig. 3—Rear view of machine showing idler pulleys and weights for maintaining belt tension

is attached to the center of the plate on which the drill spindles are mounted, allowing sufficient clearance so that the work can be placed on the arbor. When the machine is in operation, the drill spindles feed in and the holes are drilled, then the spindles withdraw, the work-arbor indexes to bring the holes in line with the taps and the taps enter to the required depth and reverse, the operation being entirely automatic. During the time that the taps are withdrawing and the work-arbor is indexing again, the piece is removed and a new one is placed on the arbor.

How Tension of Belt Is Maintained

The machine is belt-driven, each set of spindles—tapping and drilling—being driven as a unit by an endless belt off the main drive shaft of the machine. The belts are kept tight by idler pulleys connected to weights, as shown in Fig. 3. The automatic feeding unit is composed of a large gear flanked on each side by a cam, one for feeding the drill spindles, the other for the tap spindles. The gear is driven by a pinion on the end of a shaft *B* that is driven by a worm and gear from the main drive shaft *C*. Each cam has three points and at equidistant points in the mechanism are three cam-rollers, each attached to a lever that swings on a shaft to which a gear is attached. The gear meshes with a pinion attached to the shaft that carries the pinion meshing with the rack on the tap or drill spindle. Thus as the cam-rollers ride up on the points of the cams, the shafts swing and the machine spindles are fed in, reversing as the rollers ride down on the backs of the cams.

The work arbor passes through and is independent of the drive gear and cams, and is connected with a six-lobe geneva stop on the rear of the machine.

Drawings of the parts and assemblies can be obtained by applying direct to the Johnson Service Co., Milwaukee, Wisconsin.

New Standard Nuts and Bolts Under Consideration

The Society of Automotive Engineers is considering the establishment of standards for high (or thick) nuts and for airplane bolts and nuts. The latter will include both plain and castellated nuts as well as bolts, with dimensions and tolerances.

This is an indication of the growing recognition of the importance of the airplane industry, and the industry is to be congratulated on beginning to standardize such parts while it is still young. They evidently realize that it is much easier to get standards used before different makers adopt sizes of their own. Most engineers prefer a standard if one is available.

Proposed Tolerances for Ground Thread Taps

By C. M. Pond

A few of the leading tap makers have concluded to adopt a set of tolerances for ground thread taps, as shown in the tables in the next column. These tolerances are proposed by the National Screw Thread Commission. Stock taps are being made slightly larger to meet the present demand.

TABLE 18

TOLERANCES FOR GROUND THREAD TAPS

United States Standard

Size	Basic		Tap Measurements					
			Outside Diameter			Pitch Diameter		
	Outside Diam.	Pitch Diam.	Minimum	Maximum	Tolerance	Minimum	Maximum	Tolerance
¼-20	0.2500	0.2175	0.2520	0.2535	.0015	0.2175	0.2183	.0008
5/16-18	.3125	.2764	.3145	.3160	.0015	.2764	.2772	.0008
3/8-16	.3750	.3344	.3770	.3785	.0015	.3344	.3352	.0008
7/16-14	.4375	.3911	.4400	.4415	.0015	.3911	.3920	.0009
½-13	.5000	.4500	.5025	.5040	.0015	.4500	.4509	.0009
9/16-12	.5625	.5084	.5650	.5665	.0015	.5084	.5094	.0010
⅝-11	.6250	.5660	.6275	.6290	.0015	.5660	.5670	.0010
¾-10	.7500	.6850	.7530	.7550	.0020	.6850	.6861	.0011
⅞- 9	.8750	.8028	.8780	.8800	.0020	.8028	.8040	.0012
1 - 8	1.0000	.9188	1.0030	1.0050	.0020	.9188	.9201	.0013
1⅛- 7	1.1250	1.0322	1.1290	1.1310	.0020	1.0322	1.0336	.0014
1¼- 7	1.2500	1.1572	1.2540	1.2560	.0020	1.1572	1.1586	.0014
1⅜- 6	1.3750	1.2668	1.3790	1.3810	.0020	1.2668	1.2682	.0014
1½- 6	1.5000	1.3917	1.5040	1.5060	.0020	1.3917	1.3932	.0015
1¾- 5	1.7500	1.6201	1.7550	1.7570	.0020	1.6201	1.6216	.0015
2 -4½	2.0000	1.8557	2.0050	2.0070	.0020	1.8557	1.8572	.0015
2¼-4½	2.2500	2.1057	2.2560	2.2580	.0020	2.1057	2.1072	.0015
2½-4	2.5000	2.3376	2.5060	2.5080	.0020	2.3376	2.3391	.0015
2¾-4	2.7500	2.5876	2.7570	2.7590	.0020	2.5876	2.5891	.0015
3 -3½	3.0000	2.8144	3.0070	3.0090	.0020	2.8144	2.8159	.0015

LEAD TOLERANCE

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

MARKING

Taps will be marked with the diameter, number of threads per inch and standard. A symbol indicating ground thread is also recommended, for example:

A tap one inch diameter with eight threads per inch will be marked:

1″ - 8 U. S. S.

TABLE 19

TOLERANCES FOR GROUND THREAD TAPS

S. A. E. Standard

Size	Basic		Tap Measurements					
			Outside Diameter			Pitch Diameter		
	Outside Diam.	Pitch Diam.	Minimum	Maximum	Tolerance	Minimum	Maximum	Tolerance
¼-28	0.2500	0.2268	0.2520	0.2535	.0015	0.2268	0.2276	.0008
5/16-24	.3125	.2854	.3145	.3160	.0015	.2854	.2862	.0008
3/8-24	.3750	.3479	.3770	.3785	.0015	.3479	.3487	.0008
7/16-20	.4375	.4050	.4400	.4415	.0015	.4050	.4058	.0008
½-20	.5000	.4675	.5025	.5040	.0015	.4675	.4683	.0008
9/16-18	.5625	.5264	.5650	.5665	.0015	.5264	.5272	.0008
⅝-18	.6250	.5889	.6275	.6290	.0015	.5889	.5897	.0008
11/16-16	.6875	.6469	.6905	.6925	.0020	.6469	.6477	.0008
¾-16	.7500	.7094	.7530	.7550	.0020	.7094	.7102	.0008
⅞-14	.8750	.8286	.8780	.8800	.0020	.8286	.8295	.0009
⅞-18	.8750	.8389	.8780	.8800	.0020	.8389	.8398	.0009
1 -14	1.0000	.9536	1.0030	1.0050	.0020	.9536	.9545	.0009
1⅛-12	1.1250	1.0709	1.1290	1.1310	.0020	1.0709	1.0719	.0010
1¼-12	1.2500	1.1959	1.2540	1.2560	.0020	1.1959	1.1969	.0010
1⅜-12	1.3750	1.3209	1.3790	1.3810	.0020	1.3209	1.3219	.0010
1½-12	1.5000	1.4459	1.5040	1.5060	.0020	1.4459	1.4469	.0010

LEAD TOLERANCE

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

MARKING

Taps will be marked with the diameter, number of threads per inch and standard. A symbol indicating ground thread is also recommended, for example:

A tap one inch diameter with fourteen threads per inch will be marked:

1″ - 14 S. A. E. Std.

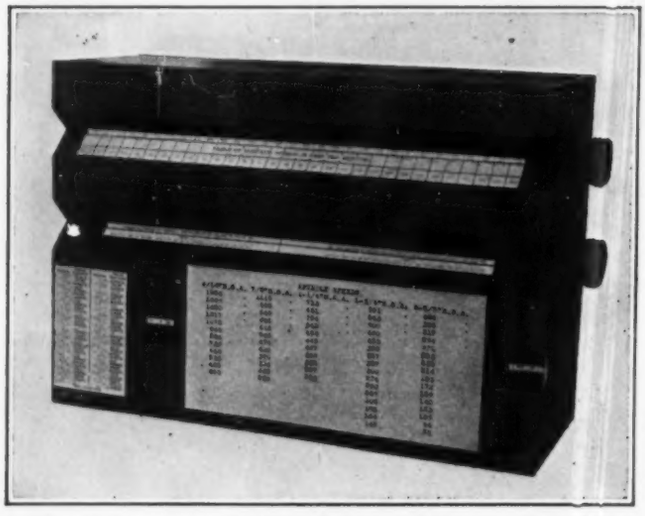
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Screw Machine Production Calculator

By C. Houghton Hoisington

The illustration shows a simple device to be used for the purpose of figuring production from screw-machines. Knowing the surface speed and rate of feed that a cutting tool may reasonably be expected to stand upon a given material, as well as the length of the shoulder to be turned, a proper setting of the device



Device for calculating screw-machine production

will show at a glance the time required to make the cut and the number of pieces that may be expected per hour or per day. The range includes stock sizes from $\frac{1}{16}$ in. to 8 in. in diameter, feeds from 0.001 in. to 0.020 in. per revolution and lengths of shoulder from $\frac{1}{64}$ in. to 11 inches.

For example: A length of 1 in. is to be turned upon $\frac{3}{4}$-in. diameter stock with a rate of feed of 0.010 in. per revolution, and the nature of the material and depth of cut is such that a surface speed of 125 ft. per min. may safely be used.

Turn the upper roll until the stock diameter, $\frac{3}{4}$ in., appears at the left end of the aperture and then, opposite the figures upon the stationary index denoting a surface speed of 125 ft. per min., read the corresponding spindle speed, 548 r.p.m., from the roll. Next, set the lower roll so that the length to be turned, 1 in., appears at the left end of the aperture and opposite the 0.010-in. division of the stationary index read the number of revolutions, 100, necessary to complete the cut. (Note. If the length to be turned is 4 in. or more, the figure denoting it will appear immediately to the right of the center line upon the roll.)

If the work is to be done upon a $1\frac{1}{4}$-in. multi-spindle Gridley automatic, a reference to the chart of spindle speeds will show that a certain combination of change gears will give a speed of 542 r.p.m., approximately very closely to the surface speed required. The time needed to complete the shoulder would be:

$$\frac{100}{542} \times 60 = 11 \text{ sec., approximately.}$$

By turning the small disk in the lower right-hand corner of the device to bring up the time (11 seconds) the number of pieces to be expected per hour (327) or per day of ten hours (3,270) may be read directly from the adjacent figures. If instead of our example, we were calculating a piece of such size, length or nature that the individual time would have been minutes instead of seconds, the output would be shown by the disk in the left-hand corner in the same manner.

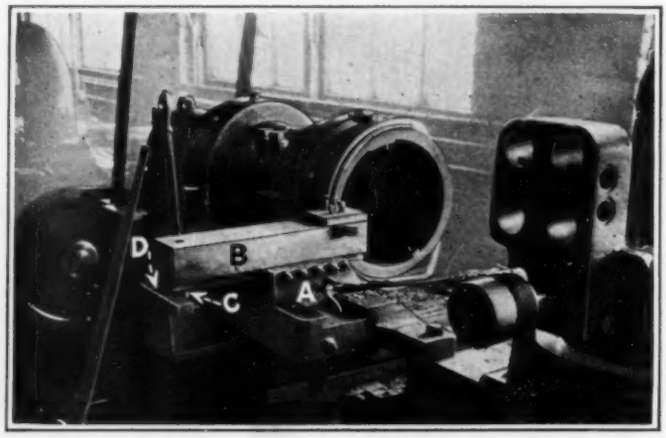
A chart of decimal equivalents affixed to the face of the device as shown is very convenient.

Device for Machining Face Cams

By Milton Wright

A Potter & Johnston turret machine, fitted up for the work of facing the contour of the cams that constitute the actuating mechanism of the Gridley automatics, is shown in the accompanying illustration. The Potter & Johnston was used for the purpose only because it happened to be available. Any lathe of equal rigidity could have been used, as the cams of the P & J, with the exception of the cross-feed cam, have no part in the work.

A cam drum, similar to the cam drum of the Gridley,



Facing cams for the Gridley automatic

is attached to the spindle nose of the P & J, and to its surface is bolted a master-cam of the same contour as the cam to be machined, further along on this same drum the work is clamped.

A secondary slide *A*, is mounted on the bed of the machine, having a movement parallel to the axis of

the spindle. This slide is moved toward the headstock of the machine by its roller riding upon the reversed face of the master-cam, and is withdrawn by a weight and strap passing over an improvised sheave held in the stationary turret.

The master-cam was originally made double faced in order to move the slide in both directions, but it was found that at the moment of reversal there would be an instant's hesitation in the movement of the slide, due to unavoidable backlash, so the weight and strap were added and the master-cams are now all single faced. A master-cam is required for each different contour to be machined. Cams of other diameters are taken care of by drums and master-cams of corresponding size, rigged up in the same manner.

Cross feeding is accomplished by means of the upper slide *B* and the regular cross movement of the machine. A roller *C* in the upper slide is free to move lengthwise along the face of the hardened steel piece *D*, and, as this piece is fed forward by the cams of the machine, the tool slide is pushed before it. Standard toolbits are used.

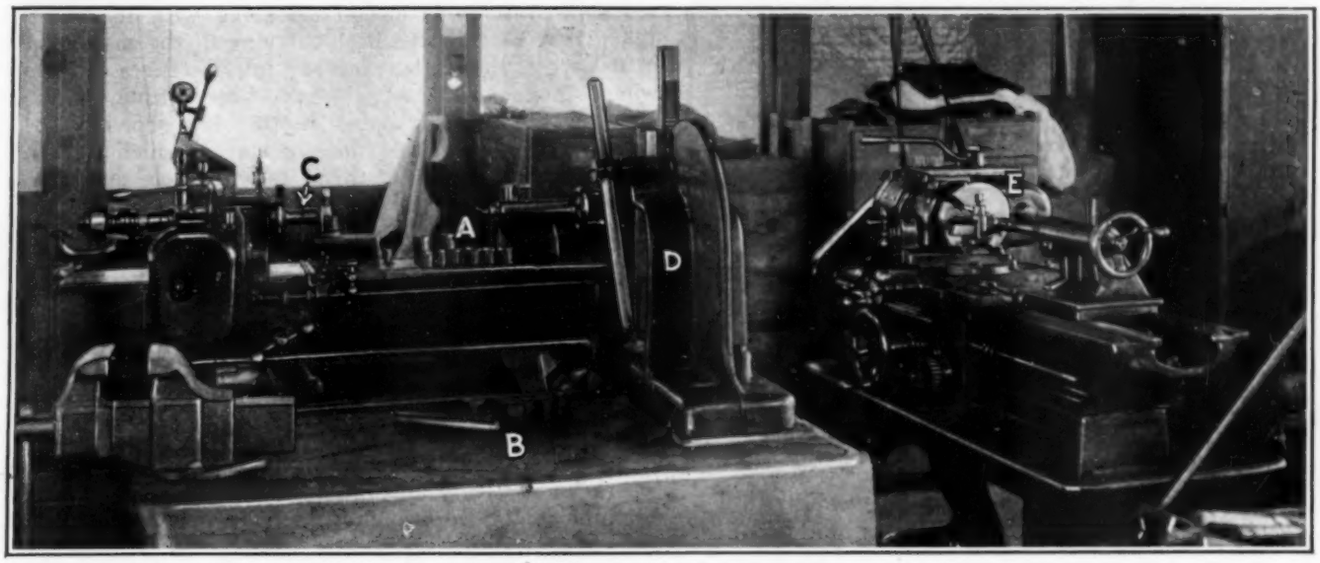
Machines Grouped to Fit the Job

By Herbert Crawford

Among the products of the Universal Tobacco Machine Co., Newark, N. J., is a large quantity of bronze bushings for use in its own machines. The bushings are first bored and then delivered to the corner of the shop shown herewith. They are about 1½x2 in. with a hole 1¼ in. Several are shown at *A* and *B*.

The rough turning is done on an expanding mandrel in the Porter-Cable lathe, as shown at *C*, the mandrel being operated through the lathe spindle. After rough turning, the operator puts the bushing on a solid mandrel by means of the Myers press at *D* and places the mandrel between centers in the Adams short-cut lathe, as at *E*, it being thought best to finish between centers to insure concentricity.

By grouping the two lathes at right angles with the arbor press on the bench between them, one man can handle the whole job and make remarkably good time. The arrangement economizes floor space.



Machines grouped to save steps

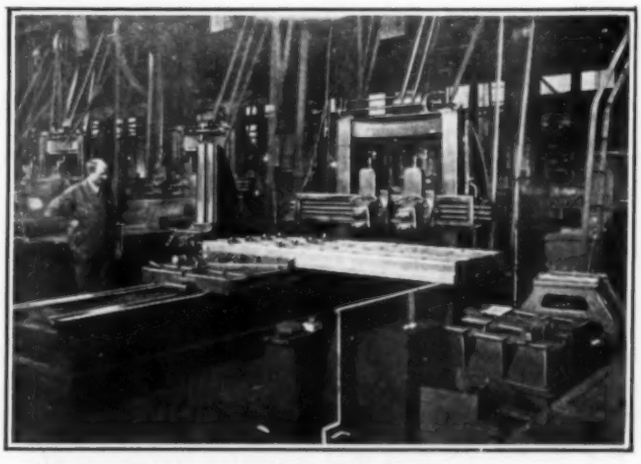
Supporting the Overhang of Long Castings While Planing the Ends

By William Denton

A method of supporting the overhang of long castings while planing the ends, is shown herewith.

The castings were clamped crosswise of the planer table and squared up by means of a square-block. As they were far too long to pass between the regular housings, an extra single housing was mounted on a concrete foundation beside the planer and at a distance of five or six feet in advance of the cross-rail. A regular saddle and tool block was mounted to slide vertically upon the face of this housing, receiving feed movement from that of the planer by means of a connecting rod and independent ratchet and pawl.

To sustain the weight of the overhanging work, a smoothly finished rail was mounted upon a concrete foundation at some distance to the right. Before setting the work, the under surface of each casting was covered with oil as was also the rail, upon which the outer end of the casting slid as the planer table moved.



Planing the ends of long castings

Press Tools for Making Cardboard Washers

BY W. HEINZMANN

The accompanying illustrations show a set of press tools for blanking and piercing cardboard washers 0.025 in. thick, three at a time.

Referring to Fig. 1, the different parts are designated as follows: *A* is the die shoe; *B* the punch holder; *C* the blanking dies; *D* the punch plate; *E* the blanking

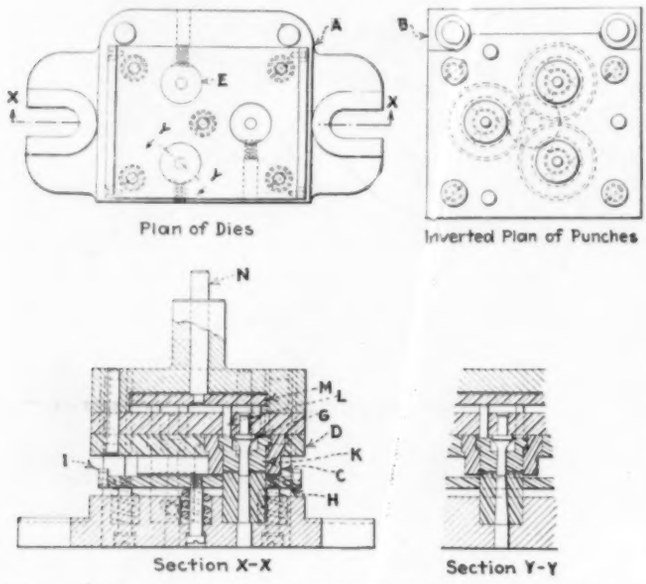


Fig. 1—Press tools for blanking and piercing washers

punches; *G* the piercing punches; *H* the stripper; *I* the stock guide; and *K* the ejector, operated through pins *L*, plate *M* and shoulder pin *N*, by the positive knockout on the press.

The tools were used in an inclined press and the washers were ejected from the blanking dies *C* at the finish of the upward stroke of the press. It sometimes happened that in ejecting the washers, one or more would not clear the dies quickly enough and would be caught by the punches, resulting in mutilated washers.

A stream of compressed air was tried, but did not improve matters much, so the changes and additions shown in Fig. 2 were made and proved very successful.

The positive knockout was replaced by the spring pins *A* which pressed the washers back into the stock aid allowed them to be carried along with the sheet. When they reached the push-out pins *B*, the movement of the press pushed them out and into the tubes *C*, from where they were removed from time-to-time by the operator by inserting a tool in the slots shown. The washers came from the tubes in stacks, which was an advantage in handling them for another operation which had to be performed.

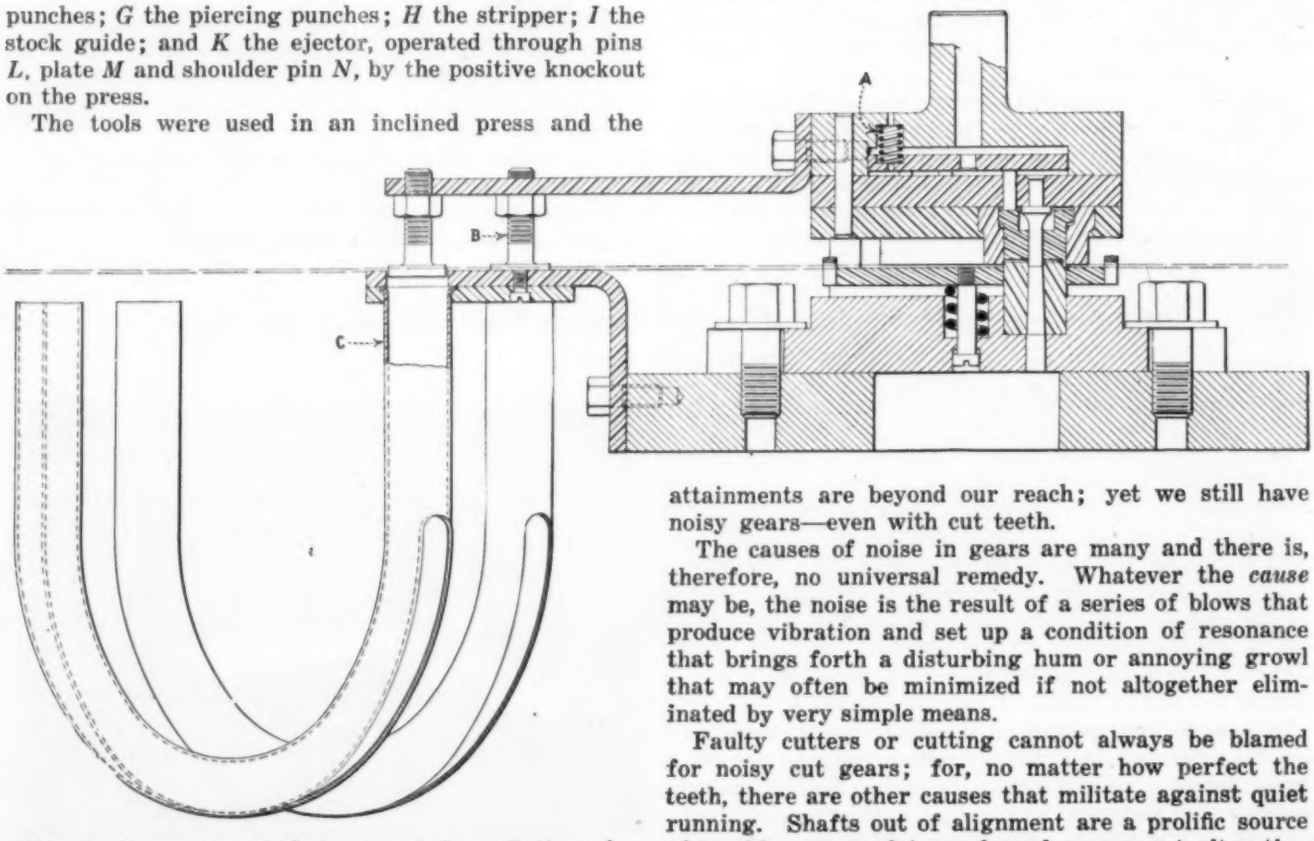


Fig. 2—Improvement that prevented mutilation of part of the washers

An Expedient to Quiet Noisy Gears

BY J. T. TOWLSON
London, England

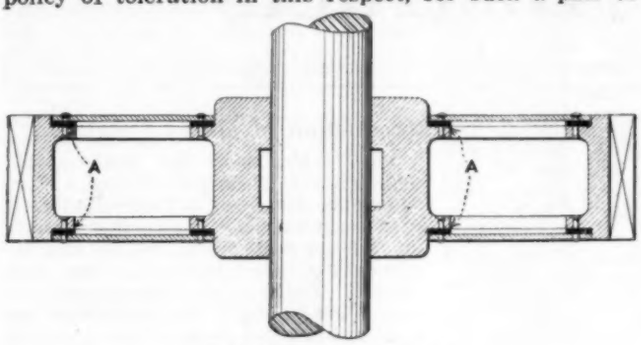
Fifty years ago cut gears were far from common and the noise from the rough, cast wheels then in use could be heard for blocks. Molded gears, "pitched and trimmed" by hand and running together with mortise-wheels having carefully fitted teeth of sycamore, hornbeam or applewood brought a measure of quietness that the old-time millwrights were wont to believe was the acme of perfection.

Machine-cut gears, then almost a dream, are now the rule instead of the exception and we of the present day, like the millwright of old, are apt to think that further attainments are beyond our reach; yet we still have noisy gears—even with cut teeth.

The causes of noise in gears are many and there is, therefore, no universal remedy. Whatever the *cause* may be, the noise is the result of a series of blows that produce vibration and set up a condition of resonance that brings forth a disturbing hum or annoying growl that may often be minimized if not altogether eliminated by very simple means.

Faulty cutters or cutting cannot always be blamed for noisy cut gears; for, no matter how perfect the teeth, there are other causes that militate against quiet running. Shafts out of alignment are a prolific source of trouble; wear of journals and consequent alteration of center distances, leaving an appreciable space be-

tween the respective pitch circles, is another, and common, cause. The writer has often observed this latter condition when looking for the cause of noise in factory gearing, and cannot speak too strongly against a policy of toleration in this respect, for such a pair of



Quieting noisy gears

wheels is always exposed to the danger of serious breakdown.

If examination of a pair of noisy gears reveals no faulty alignment of shafts, no serious wear or looseness of journals and bearings and no apparent or remediable defect in tooth form, there is available a simple remedy —or, perhaps I should say, a counteracting influence— that the writer has many times applied to large cast wheels with the effect of subduing the noise to a remarkable extent.

In the sketch presented herewith is shown a cast gearwheel 5 ft. in diameter, 12-in. face and with teeth of 1 diametral pitch. A disk of charcoal-iron $\frac{1}{8}$ in. in thickness, having a center hole to fit over the hub and of proper outside diameter to fit under the projecting edge of the wheel-rim, is attached to each side of the hub with copper rivets. Between each disk and the web are two narrow rings of lead, that may be cut from sheet lead or hammered from lead wire of sufficient size. These lead rings are interposed as shown at *A*, so that the charcoal-iron disks bear upon the lead instead of the web of the gear.

This simple remedy will in many cases bring about results in the way of reducing noise that may well astonish those who have never seen it applied.

Straightening Reamers After Hardening

By John A. Youngwirth

The little kink in hardening reamers, described by J. Spitzer on page 785, Vol. 60, of the *American Machinist*, reminded me of a job we had not long ago on some line reamers.

These reamers—there were two of them—were 24 and 28 in. long respectively, and 1 in. and $1\frac{1}{4}$ in. in diameter. Though we made them of Ketos steel and used every precaution in hardening to bring them out straight, they ran out about $\frac{1}{32}$ in. near the middle.

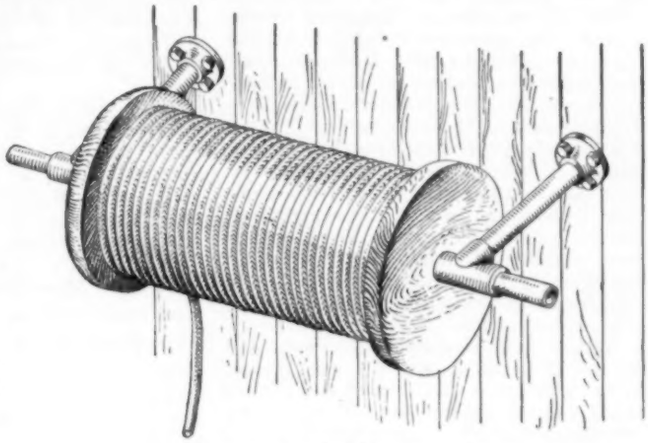
Being line reamers, the flutes did not run the whole length, and to straighten them we applied the flame of an acetylene torch to the "hump" side of the central pilot portion for a few seconds, immediately cooling the reamers again before the heat had time to spread. By a few judicious applications we succeeded in bringing them back straight to within three or four thousandths, which was well inside our grinding allowance.

Fixtures for Wire and Rope Reels

By G. A. Luers

In uncoiling rope, electric wire and cable from coils kept on the floor much time is lost in untangling and taking out the kinks.

A simple and cheap arrangement for holding reels of such material is shown in the accompanying sketch. The reel holders are made from pipe and fittings and consist of two pipe-flanges, two short lengths of pipe



Fixture for holding a reel

and two tees for each reel. A piece of pipe passing through both the reel and the tees completes the arrangement.

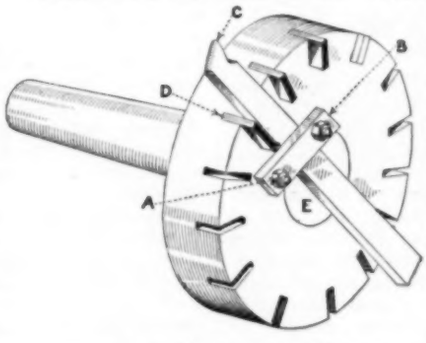
The holders can be placed on the shop wall at any convenient height and when the reels are mounted in them, much floor space will be saved, as will be the time in uncoiling and measuring the quantity of material wanted.

Face Mill Used as a Boring-Tool Holder

By William F. Sandmann

As many shops do not possess a boring mill, the arrangement shown in the illustration will make it possible to take care of accurate boring work of large diameter and average depth, on a horizontal or vertical milling machine, without special equipment.

Two holes are drilled and tapped in the end of a large face mill, and studs inserted as shown at *A*. The boring tool *C* is clamped against the face mill by the clamp *B*. The inserted blade *D* absorbs a part of the tool thrust and acts as the driver.



Face mill used for holding a boring tool

In many face mills the shank is pressed into place as shown at *E*. In cases such as this, the studs are sometimes placed in the end of the shank instead of the cutter body itself. The value of the face mill as a milling cutter is not impaired in either case, as the studs are easily removable. It will be found that there will be no chatter when using this method of boring.

Technical Abstracts

200,000 Piston Rings a Day

The Ford Motor Company safeguards the production of its piston rings with utmost care from the time the iron is heated in the foundry cupola until the finished rings are finally fitted to the cylinders.

F. E. Lockhal describes the operations. Rings are cast in the form of pots, the weight of the pot runs from four to five ounces and the weights of the 12 finished rings run from one to two ounces. A heat is poured and tested every thirty minutes and if satisfactory the pots are sent to the piston ring department.

In the first operation the pots are set up on a lathe and the boring and first operation is performed and the 12 rings are cut separately. A maximum variation of 0.008 in. is allowed.

The second operation consists of facing or cutting the top and bottom of the ring down to the finish thickness held between 0.246 and 0.248 in. This is done on both sides at the same time to insure parallelism. All together there are some twelve separate operations, the last one being the final turning operation.

Inspection tests are made very rigidly every hour. The test is made on an arbor load of twelve rings from each finishing lathe. This is made chiefly to check the precision of the lathes and cutting tools, and therefore is not made on every ring. Rings are also scrutinized for every defect such as blow holes and tool marks, and in addition there is a super inspection by other than the regular inspectors to make sure that the rings are kept up to the high standard demanded.—*Am. Auto. Digest*, June, p. 47.

Portable Macine Tools With Electric Drive

Rather thorough investigations undertaken at some prominent German works have shown that the transport of pieces to heavy stationary tools and the power and oil consumption of these tools often make it cheaper to use portable tools, the investment charges on which are lower than for the heavy tools. Certain deficiencies of the portable tools, which have in the past retarded their use, have now been overcome by study and design.

Thus lightness combined with great strength and cooling capacity has been attained by the use of a high-strength aluminum alloy. Especial attention has been paid to a design that allows the handling of the tool without excessive fatigue on the part of the worker and allows electric connections and switching of current to be made without change of position. Prevention of fouling by dirt and excessive dust production in the case of grinding machinery has been attained. Rusting and deterioration of the bearings of the tool during storage have been prevented by extended use of ball bearings.

As a special advantage of the small electric drive it is mentioned that the speed of the tool adjusts itself almost automatically to the resistance, the power consumption and the efficiency remaining practically unchanged.—*Die Werkzeugmaschine*, April 30, p. 144.

Material Handling Problems Encountered in the Assembly of Automobiles

M. R. Denison of the Studebaker Corporation in his paper states that in the South Bend machine shop, a one story building 480 x 520 ft., there are 850 productive men working on 2,200 operations and 431 parts, the operations are entirely progressive and parts move forward to the center bay where the inspection benches are located. Only two hand truckers are employed in the work.

Mr. Denison believes that the stores division is a service department to productive manufacturing departments, and in the Studebaker company stock is delivered absolutely in sets based on car specifications to the assembly departments on a schedule basis. He says that it is just as logical to schedule delivery of parts from finished stock rooms to assembly lines as to schedule material from the manufacturing department to the stores.

On the problem of physical location of store rooms, he states that these should parallel assembly lines and be of the same length. Cranes and other handling devices should be used freely. One specific instance illustrates his point. Forge billets are taken from the yard along side of the forge shop building by overhead cranes to the shear house at one end of the yard. A magnet then delivers the billets into chutes direct to the heat-treating furnaces, which in turn are located above the forge hammers. The heated billets are dropped down another chute to the hammerman as he completes the forging. After forging, the parts are moved through the remaining operations in steel baskets by overhead cranes operated over every foot of the forge shop building.

Considerable detail is gone into in the handling of other material and the methods involved. Incidentally storeroom men are instructed carefully in their work, particularly in the handling of expensive items easily damaged.

One point is the installation of automatic counters at inspection benches, preventing the possibility of mistakes. —*Mech. Eng'g.*, June, p. 339.

Production of Heavy Forgings

One of the parts described in this paper is the banjo axle forged by the Champion Machine & Forge Company of Cleveland. The axle illustrated is made from stock 4¾ in. square and requires five operations for its completion. The first operation takes place in a 2,000-lb. steam hammer where the ends are reduced from 4¾ in. sq. to 3¾ in. sq. To make the banjo the stock is forced into an oblong shape under a 10,000 lb. steam hammer and its center section punched out in a 1,500-ton press. The rough forging is then placed on the finishing die in a 12,000-lb. hammer and the forging operation completed. There is one additional operation to twist the forging to the proper angle. The forging weight of this piece was 375 lb.—*Mech. Eng'g.*, May, p. 241.

Automobile Production Methods in Central Europe

From sheer necessity European manufacturers have been compelled to explore every avenue likely to yield to economies in production. This has brought about distinct developments, first, the limiting of number of types produced and second, the forming of trusts or groups. A serious study was made of American practice including the Taylor system of scientific management, and most of the leading firms have adopted group production and have arranged each department so machine tools and workmen are grouped in the order of the operation performed, thus reducing to a minimum transportation within the factory.

The Steyr Company has had to use several thousand milling machines which were the heritage of the war but these are so arranged that a single operator can attend to several machines. One interesting example is the stub axle, which, with the exception of grinding the seats for the ball bearings, is entirely produced on milling machines.

About ten per cent of the machine tool equipment is either British or American. For rear axle gears, Gleason and Reinecker machines are largely used and inspection departments are being organized in a very thorough manner. The inspectors are not under the control of the departmental managers.

Many firms employ Saurer apparatus for testing both spur and bevel gears and many other testing machines for other parts of the car are in use.

One paragraph deals with the fact that almost invariably there is a system for training apprentices in vogue. —*The Automobile Engineer* (*Eng.*), April, p. 106.

Nitrated Iron, a New Surface Hardening Process Without Warping

Dr. Ing. Ad. Fry of the Krupp Works in Essen gives a detailed report on researches regarding alloys of iron and nitrogen. The formation and composition of these alloys appear to have been thoroughly cleared up.

On the basis of these researches a new surface hardening method has been developed, which not only produces greater hardness than hitherto attainable and does it in a simple and dependable manner, but also does it without any warping effects whatever. The method consists in heating certain alloy steels, such as chromium and titanium steels, in ammonia at a temperature under 580 deg. C. The hardness is produced even with slow cooling, and quenching does in fact not even increase it. The thickness of the hard surface layer is about 0.7 mm. (0.028 in.). In view of the plasticity of the core, hardness measurements either by the Shore or the Brinell method are not dependable, but values up to 110 Shore and 750 Brinell have been found. The surface can however, not be filed and readily cuts glass and even quartz. The scatch test shows it much harder than hardened carbon steel.

The nitration process causes a small amount of growth, 0.001 to 0.02 mm. on each surface (0.0004 to 0.0008 in.). In spite of this the method has been found perfectly applicable for the surface hardening of finished articles, such as spiral gears, journals, measuring instruments, etc.—*Die Werkzeugmaschine*, March 15 and Apr. 30, p. 86 and 141.

Inspection Methods

A report of the Detroit Section Meeting discussion on inspection methods as practiced by the Packard, Lincoln, Cleveland and Studebaker shops is given.

In the Packard company gaging for the S.A.E. standard is performed by internal and external gages of the "Go" and "No-Go" type, having only three threads in actual contact with the work. Lead indicators are used to check the lead. It is stated that this system of inspection has materially reduced the number of inspectors and that a better product is the result.

For the inspection of small parts such as screws and nuts, a type of inspection known as the general inspection has replaced the percentage system in the Packard shop. Stock may be in lots of from 100 to 50,000, but instead of having a positive percentage, the inspector distributes the entire contents of the container on a bench and quickly vizualizes the general condition of the material. Pieces are picked up at random here and there and this enables the inspector to determine rapidly the general condition of the complete amount. Packard inspectors are denied the responsibility of exercising any judgment whatsoever in passing material not entirely up to blue print. Their sole function is to separate the work before them strictly in accordance with the gages supplied. Rejected material is placed on a special bench in each department and is scrutinized by a special committee comprised of the various executives, including the chief inspector.

A. H. Frauenthal of the Chandler Motor Car Company discussed examples of time study made to reduce inspection cost such as scleroscope operation by pedal instead of by hand. Another example was of a special fixture used for checking water pumps which checks ten different items at one time.

C. J. Jones of the Lincoln Motor Company stated that the important phase of their inspection work was the co-operation of their engineering and production department and that quality reigned supreme on the work they do. A complete and detailed inspection is given on every subject and at every operation. No variation is allowed from specifications. Not only is this done on parts produced in the Lincoln plant but every accessory used on the Lincoln is similarly inspected.

K. L. Herrmann of the Studebaker gave some of the methods whereby screw thread precision is maintained. He gave one piece of advice in stating that ground taps would be found cheaper in the end. This is based on the holes tapped per dollar.—*S.A.E. Jrnl.*, May, p. 372.

Pipe and Rod Cutting Machine of Bornemann

The peculiarity of this machine is that the tools are held against the piece to be cut by means of centrifugal force. The chip thickness is therefore regulated automatically in correspondence with the nature of the material. A very smooth and even cut results. Tools only 2½ to 3 mm. (0.1 to 0.12 inch) wide can be used, and the life of the tool is long. Discs only 0.2 mm. (0.008 inch) thick can be cut. A boring attachment makes it possible to produce rings and pierced discs.—*Die Workzeugmaschine*, Apr. 15, p. 121.

Handling Material in Painting Department

E. T. Bennington of the Cleveland Crane & Engineering Company gives a description of the process of dipping filing cabinets, but the same fundamentals that Mr. Bennington describes, as well as the processes, are applicable to automobile bodies and chassis parts.

In the plan shown is illustrated a practical application of an overhead conveyor system of this kind installed in the paint department and its relationship to the other departments, which are usually served also by monorail systems.

It will be noted that the ovens are so located that the painting department is on one side of them and the finishing, inspecting and packing departments are on the other side. The entire arrangement is such that the products to be painted need not be handled as individual pieces from the time they leave the machine where the last operation is performed until the painting is completely finished.—*Iron Age*, May 15, p. 1413.

Quality Control of Inventories In Large Manufacturing Plants

This sixth article on the General Motors Corp. is continued by E. Karl Wennerlund, Head of Department of Factory Organization. It reviews the early days of the industry when it was taken for granted that financial control of material inventories was the best kind of control, but this has gradually given way to what might be termed as "quality control." It eliminates a large amount of clerical detail.

It is the experience of the General Motors that the more freely material can be moved into and throughout the factory, unhampered by non-essential clerical detail, the more economically they can manufacture and the larger will be the volume of production with a given equipment. The way to have control of inventory, and its future commitments, is to control each individual item that enters into that inventory. If the quantity on hand, and the quantity still to come in, of each item, are right for a given manufacturing program, then the inventory as a whole must be right.

It is Mr. Wennerlund's opinion that we should not today maintain the large volume production we do if our factories were again to be saddled with the detail factory clerical system that prevailed a dozen years ago. The two could not go together. Either the production rate would fall, or the detail would have to go.—*Management and Administration*, June, p. 677.

Aluminum Silicon Alloys

Within the last twelve months or more several alloys of aluminum with silicon have appeared. The better known of these are "Alpax" from America, "Silumin" from Germany and "Willmil A and B" produced in England. All are binary alloys containing from 5 to 12 per cent of silicon and are made mostly from secret or patented processes. They are not easy to handle in the foundry, great care having to be taken to bring out the valuable properties of the product. Their most conspicuous advantages are their considerable elongation and ductility combined with a comparatively high tensile strength. They also retain this while hot better than most light alloys.

This article gives micro-photographs and ends with a tabulation showing the characteristics as follows:

TEST BAR CAST IN HALF SAND AND HALF CHILL

Ultimate strength	[illegible] lb. per sq.in.
Elastic limit	13,700 lb. per sq.in.
Reduction in area	11.60 per cent
Brinell hardness	47.0

This is for a 7.30 silicon content. The forged and rolled aluminum alloy shows stress:

Ultimate strength	26,500 lb. per sq.in.
Elastic limit	22,800 lb. per sq.in.
Reduction in area	36.5 per cent
Brinell hardness	44.9

After annealing for one hour at 500 degrees C. the reduction in area is increased, amount not stated, but the elastic limit is decreased to 17,800 lb. This is for a 6.66 silicon content.—*The Automobile Engineer (Eng.), April, p.* 102.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

The American Machinist Starts Its Sixty-first Volume

WITH this issue the *American Machinist* commences its sixty-first volume. Established in 1877, the paper has forged steadily ahead, a mirror of the progress in the mechanical arts and a leader in the thought of the metal-working industry. During its nearly forty-seven years, the *American Machinist* has not changed its name nor has it absorbed any other papers or combined with any.

The present editorial staff consists of Kenneth H. Condit and Fred H. Colvin, editors; A. L. DeLeeuw, consulting editor; L. C. Morrow, managing editor, and S. A. Hand, Ellsworth Sheldon, Howard Campbell, F. E. Bardrof and John Younger, associate editors.

Metal-Hull Flying Boat Stands Severe Service

THE RECENT return of the metal-hull flying boat Morro Castle, II, of the Aeromarine Plane & Motor Co., from a 14,000-mile trip to Porto Rico and other points in that vicinity, is particularly interesting as showing the practicability of air travel. During the entire trip the boat was in the air every day but two and the total supply of spare parts weighed less than 100 lb. and were carried in a small box. About 3,000 passengers were carried at various times and the boat flew in all kinds of climatic conditions.

The hull of this flying boat is built of 17S aluminum alloy and has seven water tight compartments. After 23,000 miles of flying, landing in rough water and floating at anchor, there are no signs of deterioration. This is in marked contrast to wooden hull boats which soak up water in large enough quantities to interfere with getting off the water and flying. Performances of this kind bring us nearer the utilization of aircraft for long distance, commercial flying.

Profit Sharing for Designers of Special Machines

AFTER a noted surgeon performs a delicate operation he renders a bill which frequently seems exorbitant to the patient, if he survives. The amount of the bill is not based on the time taken for the operation, for a thousand dollars is frequently charged for a half-hour's work.

The designer of special machinery is not so fortunate. Unless he can name, and get, a flat price that will cover his time and a nice fat sum in addition, he is not often properly remunerated. The time he spends in designing the machine is not a measure of what he puts into it. As with the surgeon, it is his previous experience that makes him a success, and it is for this he should be paid, fully as much as for the time spent on the work.

A manufacturer recently came to a designer and builder of special machinery who has the reputation of making machines that give excellent satisfaction. The problem was outlined to him and he decided that he could build a machine that would be satisfactory. The result was one of the most ingenious combinations of well-tried devices we have seen, a combination that none but a man who had spent years in actual designing and building would have had the knowledge and judgment to put together. The machine worked satisfactorily in every way. It was so simple and substantial as to be practically unbreakable. It reduced the labor cost to an almost unbelievable figure. The manufacturer paid the very moderate price asked but the savings paid for the machine in four months of service. Think of it, in four months!

The designer and builder of special machinery deserves more return on his investment of time and money, and a greater financial return for his ability and experience. It has been proposed, and there seems to be merit in the proposal, that a percentage of the savings effected by the machine during a reasonable period should go to the designer, in addition to the price for the machine itself. In this way the designer's compensation would be directly proportional to the value of his work. He would have an added incentive to do his best and he would be placed more nearly on a par with the other professions.

One Solution of the Used Car Problem

B. W. TWYMAN, of Indianapolis, is proceeding to solve the used car question in a unique way. He takes Buick and Nash cars at least three years old, tears them down completely to the last cotter pin, cleans them and inspects them and then from the parts rebuilds what might be called new cars. This process is not new. It was used first, we believe, by Colonel James M. Furlow and Mr. George Randles in the Motor Transport Corps during the war in rebuilding White and Dodge cars and many others in groups of at least one hundred or more.

The important part of Mr. Twyman's idea is that it is applied in a commercial way and is the means of saving a great quantity of material that would otherwise be scrapped. It is pointed out that over seventy per cent of the car is fit to be used again.

There is a strange paradox in the used car. The part that has the least value to the junk dealer is often the most costly part originally and is also the least used part of the car. Take the crankcase for example. It is probably just as good on a five-year old car as it was originally but a junk man can only get a fraction of a cent a pound for it and it still has many years of use in it. Mr. Twyman has done a valuable service in showing the latent worth that lies in used cars.

Just Suppose

JUST suppose that all the men who go around fearing the worst about business and whispering or shouting their fears to everyone who will listen made sure of their facts before reaching their conclusions.

Crepe-hangers never make sure of their facts, you say? Perhaps not, but

Just suppose.

Shop Equipment News

Niles-Bement-Pond Heavy-Duty Lathe

A number of features that insure convenient and rapid operation, together with durability and adaptability for heavy service, characterize the heavy-duty lathe recently placed on the market by the Niles-Bement-Pond Co., 111 Broadway, New York, N. Y. The machine can be arranged for driving by either d.c. or a.c. motors or through a single belt pulley, and is furnished in three sizes, 27-, 30-, and 36-in. Fig. 1 illustrates the lathe with a d.c. motor drive.

The bed is deep and heavy and the details of its rigid construction are shown in Fig. 2, in which it will be noted that the front way is of the LeBlond compensating V-type designed to resist the thrust of the tool in all directions. The rigidity of the bed is increased by the use of an inclined web between the front and back walls and double-wall crossties spaced every 24 in. The chips fall upon the inclined web and slide through the openings in the back wall to the chip pan at the rear. This provides a means for easily cleaning out the chips and prevents their falling on the floor. The coolant flows down the chip pan to the head leg of the machine where a suitable reservoir and settling basin is provided. Cabinet-type legs support the bed.

The only difference between the headstocks for the different styles of drive is the number of geared speed changes provided. When a variable-speed d.c. motor is used four speed changes are given by the head, and for the other drives a total of twelve changes are available. The driving motor is mounted on the head as shown and drives through enclosed gearing located in a housing which is part of the head cover. The driving pinion is not mounted on the motor shaft but is carried on a shaft that is mounted in two bearings in the housing and connected to the armature shaft by a flexible coupling. This construction relieves the motor bearings of all load except the armature and increases their life, as well as protecting the motor from serious damage which may result from badly worn bearings. The drive gearing runs in an oil bath.

The speed of the motor is controlled by a handle at the apron, by which it can be started, stopped or run at any desired speed within its range. In order to obviate the necessity of a friction clutch in the drive, for use when changing the speed gears in the head, a jog-button control is provided for the motor. This button is located just below and to the right of the motor and causes the gears in the head to revolve very slowly when pressed. The gears can be revolved through a small angle to get the teeth into proper mesh when shifting the gears, and the control can also be used to revolve the chuck or faceplate slowly.

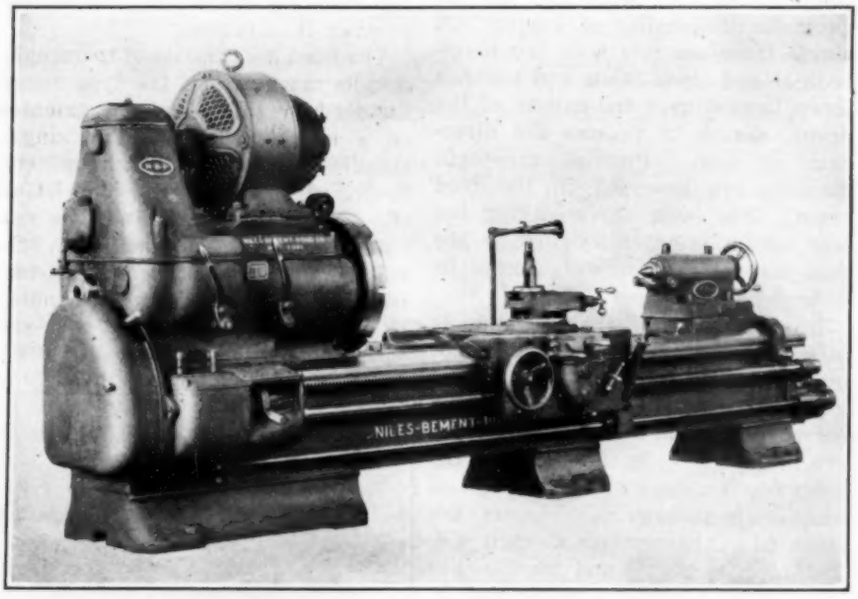


Fig. 1—Niles-Bement-Pond Heavy-Duty Lathe

Fig. 2—End view of Niles-Bement-Pond lathe

The spindle speeds are controlled by two levers on the front of the head casting and a direct-reading plate makes the selection of any desired speed convenient. All of the head gears and, in fact, all the gears in the machine are of the Maag type and are said to provide an exceptionally quiet and easy-running mechanism. All gears are heat-treated. When the d.c. motor control handle is moved to the "off" position, the motor is brought quickly to a stop through the dynamic braking circuit. The a.c. motor drive has a mechanical brake. A multiple-disk clutch is provided in the belt drive and a brake is applied when the clutch is disengaged.

A rapid traverse for the carriage

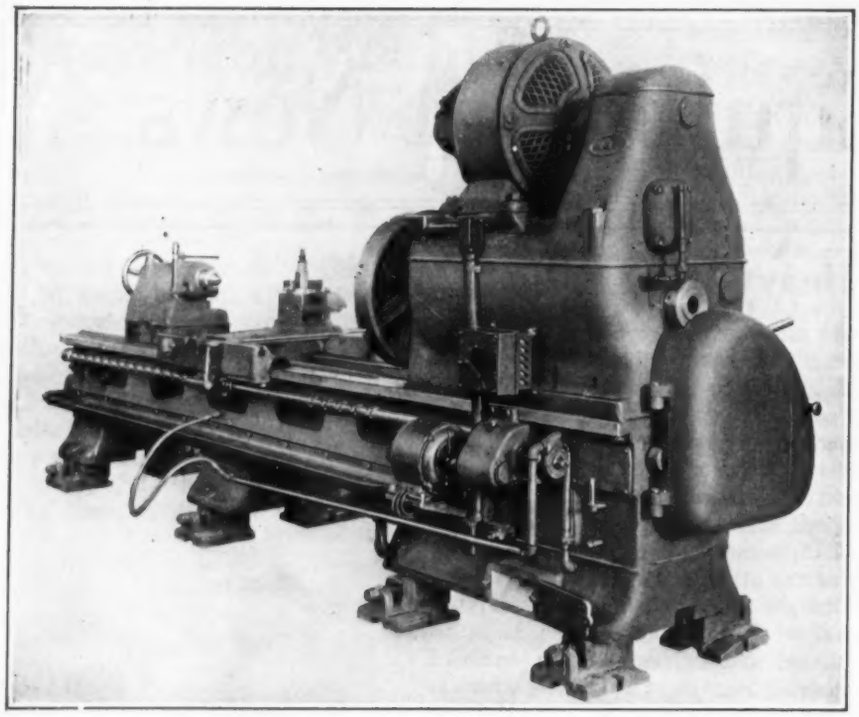


Fig. 3—Rear view showing rapid traverse mechanism

is provided and is driven by the mechanism shown in the rear view of the lathe, Fig. 3. A right and left long-pitch screw is mounted in bearings on the back of the bed and is rotated by an independent motor driving through an enclosed gear train. Two nuts are carried in a bracket on the back of the carriage, one of which is arranged to mesh with the right-hand and the other with the left-hand thread of the screw. Either nut may be engaged

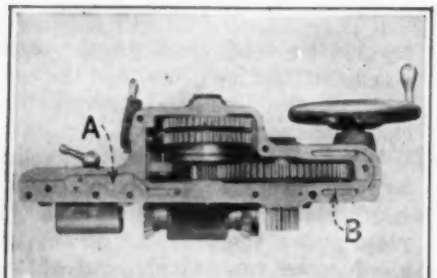


Fig. 4—Top view of apron mechanism

with its screw by means of a single lever at the front of the apron, thus giving rapid motion to the carriage.

The apron is of the double-wall, one-piece type of construction in which all shafts have bearings at both ends. A top view of the apron is shown in Fig. 4 with the top plate removed, and it will be apparent that the ends are compactly designed so that the overhang is not great and the operator can get close to the work for measuring or gaging. A single lever controls both the longitudinal and cross feeds and another lever, located near the bottom of the apron, serves to reverse the direction of feed. Positive fine-tooth clutches are provided in the feed train. The lever for engaging the lead screw is interlocked with the feed control so that both cannot be engaged at the same time.

The front end of the tool slide is offset so that the handle will not interfere with the crank on the carriage traverse shaft. A clamp for the carriage and a thread indicator are incorporated in the carriage. Oil holes for the ways are provided, and suitable metal and felt wipers are attached to the carriage at each end. The apron gears and shafts are oiled from reservoirs at *A* and *B*, Fig. 4. The tailstock is exceptionally heavy and is provided with a crank-operated traversing mechanism.

The gears that drive the feed mechanism are mounted at the head end of the machine and are enclosed by a heavy, cast-iron cover hinged to the frame. The feed gear mechanism is of the quick-change type and is mounted as a self-contained unit on the head end of the bed. A direct-reading plate makes it easy and convenient to select the desired feed. All of the gears and bearings in the feed box are continuously flooded with oil from the circulating oil supply, furnished by the oil pump through the headstock. Without the removal of gears, the feed box provides 32 changes of feed and thread, the total number being forty-eight.

The 27-in. lathe has a swing of 29 in. over the bed and 20¾ in. over the carriage; the 30-in. machine swings 32 in. over the bed and 23¾ in. over the carriage; and 37½ in. over the bed with a 29¾-in. swing over the carriage is the capacity of the 36-in. machine. Each machine requires a motor of 15-hp. capacity. The speed range of the d.c. motors should be from 500 to 1,100 r.p.m., 900 r.p.m. being the speed of the a.c. motors. The available distance between centers on each machine is 61 inches.

H & G Two-Spindle Threading Machine

In order to produce a double-spindle threading machine at a low first cost, the Eastern Machine Screw Corp., Truman and Barclay Sts., New Haven, Conn., has brought out the machine shown in the accompanying illustration.

The machine consists of two single-spindle machines, of the type manufactured by this company, mounted on a single pedestal. The single-spindle threading machine was described on page 1012, Vol. 54, of the *American Machinist*. The machine may be equipped with the spindle and collet type of tailstock when short pieces are to be handled, or with the quick-acting open-side jaw type for long pieces.

H & G Two-Spindle Threading Machine

Cleveland Multiple-Spindle Automatic Screw Machine

A multiple - spindle automatic screw machine, designed along the lines of its Model A single-spindle machine, has recently been placed on the market by the Cleveland Automatic Machine Co., Cleveland, Ohio. The machine has capacity for ⅞-in. round, ¾-in. hexagonal, or ⅝-in. square stock. Among the features of the machine may be mentioned the simplicity of the mechanical movements and the accessible position of the cams and adjustments.

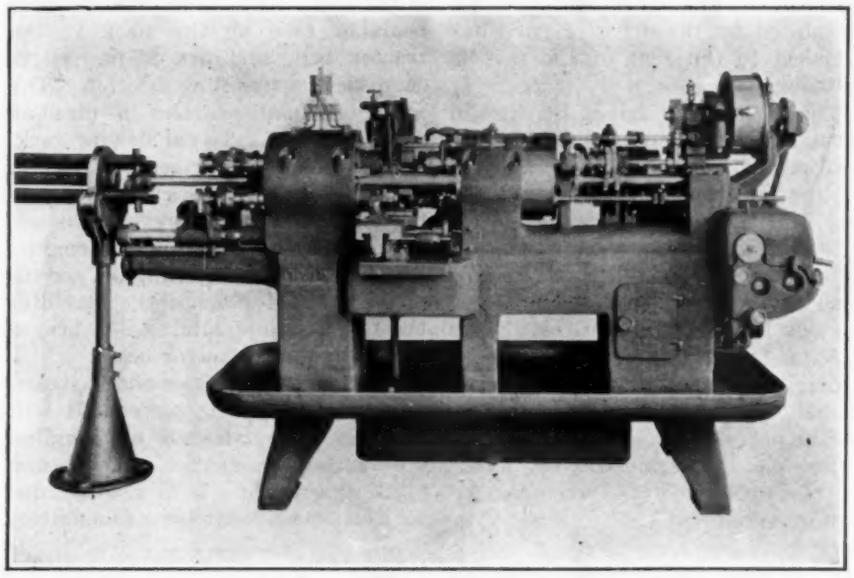


Fig. 1—Cleveland Multiple-Spindle Automatic Screw Machine

The tool turret is mounted at the center of the machine, Fig. 1, the work spindle cylinder being located at the left-hand end of the machine with the driving pulley and change gears for spindle speed and tool feed at the right. The spindles are driven through a center shaft by hardened steel helical gears and seven speeds are available through the use of change gears. The gear box for the feed box mechanism is located directly below the driving pulley at the right-hand end of the machine and provides ten feed changes for each spindle speed. Any feed is instantly available, the speed of the idle movements being constant.

The front bearings of the work spindles in the cylinder are bronze sleeves attached to the spindles and running in hardened adjustable steel bushings. The rear spindle bearings are constructed in the same way but are not adjustable. The spindle end thrust is taken on ball thrust bearings, located in front of the rear spindle bearings and provided with adjusting nuts at the rear end of the cylinder.

The indexing mechanism for the cylinder consists of a Geneva movement positioned at *A*, Fig. 2, and the lock is a heavy flat wedge operated by the indexing arm. The chuck opening and closing slide is actuated directly from the cam without levers, providing an efficient and simple mechanism. Each chuck hood is covered by an individual cast-iron guard that protects the hood and prevents the throwing of cutting compound at high speeds.

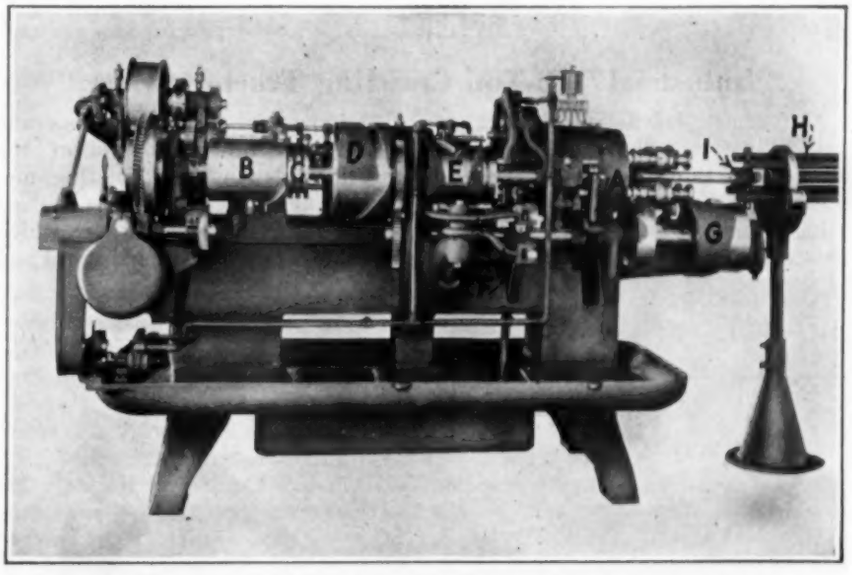


Fig. 2—Rear view of Cleveland multiple-spindle automatic

The tool turret is a heavy cast-iron cylinder mounted in a bearing in the frame and sliding on a hardened steel center tube, one end of which is supported in a fixed bearing and the other in the spindle cylinder. This tube will be noted in the front view of the machine, Fig. 1. The first and second tool positions are in front with the threading and accelerating spindles in the rear.

An important feature of this turret is the independent tool spindle at the fourth position, by means of which a tooling operation may be performed and completed before the other tools have finished their work. The feed of this independent slide may be accelerated to twice that of the turret in order to ream or finish mill the total length of work covered by the preceding tools, receding before the other tools have completed their cutting stroke without delaying the cut-off tool. Should the accelerated feeding action of this tool spindle not be required, its operating rod may be disconnected and the spindle clamped to the turret.

The third position of the tool turret accommodates a revolving die spindle driven from the center shaft by suitable gears. Two selective threading speeds are available and a clutch provides increased speed for backing out a tap or solid die. The driving clutch has a neutral position in which it may be placed when there is no threading to be done. The spindle is then clamped to the turret and any tool can be used in this position.

As will be noted from the rear

view of the machine, Fig. 2, the camshaft is located as in other machines made by this company and is driven by a worm and wormwheel at the left. The wormwheel is fitted with a shear pin arranged to fracture in case of any interference or overload on any of the cams, stopping the tool turret and the cross slides. The drum *B* carries the cams that control the independent fourth position tool slide and the threading spindle, and the smaller cam *C* at the right of this drum actuates the clutch for increasing or decreasing the speed of the threading spindle. The cam drum *D* actuates the feed of the tool turret, the drum *E* performing the same service for the cross slides.

Three cross slides are provided as regular equipment and include roughing and finishing forming slides instead of double-deck posts, as generally used. A fourth slide can be fitted as an attachment when required. The spindle cylinder is fitted with individual cross-slide stops for each spindle. The cam levers *F* that actuate the slides are short and strong and accessibly placed. Each slide has its individual cam and can be moved to work in any position of the turret.

The feed tubes are operated by two slides driven directly by the cam *G* without intervening levers. Spring action is used for feeding the stock and the parts are so arranged that the tubes will always be picked up by the slides regardless of their longitudinal position. A gage stop swings up to meet the bar stock as it feeds out and then drops back out of the way. The reel stock tubes *H* are bushed to suit the diameter of the stock and the reel is rotated by the driver *I* on a bar attached to the rear of the spindle cylinder.

The oil pump is driven by a chain from a constant-speed shaft in the feed mechanism. The chips and the cutting oil drop straight through the bed into the pan and cannot interfere with the mechanism. Cams of different pitches and lengths can be used on the tool turret drum *D* for various lengths of pieces. Work up to 7 in. in length can be done when the milling stroke does not exceed 3½ in. The maximum milling stroke is 5 inches.

For motor driving a 5-hp. motor is required and the recommended motor speed is 1,750 r.p.m. The floor space necessary to accommodate the machine is 36x96 in., and the weight with the countershaft is 4,700 pounds.

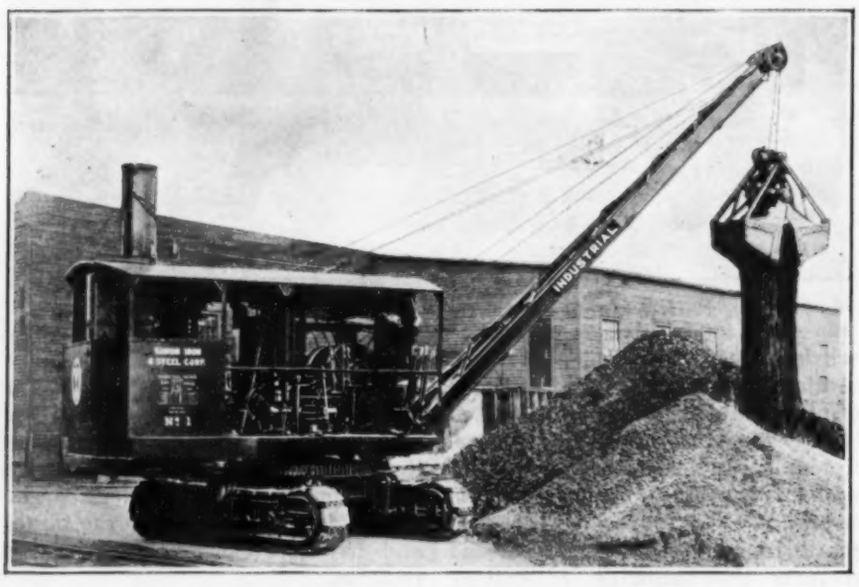
"Industrial" 10-Ton Crawling Tractor Crane

A recently marketed product of the Industrial Works, Bay City, Mich., is a 10-ton, crawling, tractor crane, designated type D. The machine is shown in the accompanying illustration, using the grab-buckets.

An important feature of this crane is the independent control of the traveling, slewing and hoisting motions. These motions may be utilized in a variety of combinations which are said to give exceptional speed and efficiency of operation. The entire upper works rest on a rotating steel base which insures rigidity and good alignment. This base rotates on four conical steel rollers which can be removed without jacking up the crane. Side frames for the shaft bearings are bolted to the bed, and all bearings are fitted with replaceable bronze bushings.

A pressure system for lubrication is installed. Adjustable idle sprocket bearings take up the slack in the tractor belt, and five 25-in. rollers decrease the traveling friction. The steel bed plate carries a circular roller path and external slewing rack, and a hollow steel center post is pressed into it. The crane has two traveling speeds and reversal is accomplished by reversing the engine. Steering while propelling is accomplished from the operator's platform through friction clutches and brakes controlling each tractor belt.

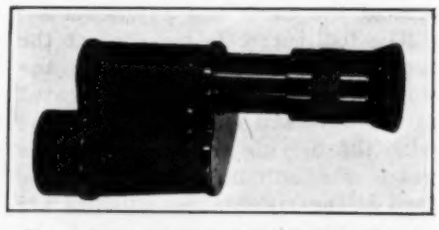
The crane is built for either steam, electric, or gasoline power. It will operate with clamshell or dragline bucket, electromagnet, hook and block or grapple. It is readily convertible into a shovel or a pile-driver.



"Industrial" 10-Ton Crawling Tractor Crane

Bausch & Lomb "Telemagnifier"

An optical instrument that bridges the gap between the reading glass and the field glass or telescope and is known as the "Telemagnifier" is



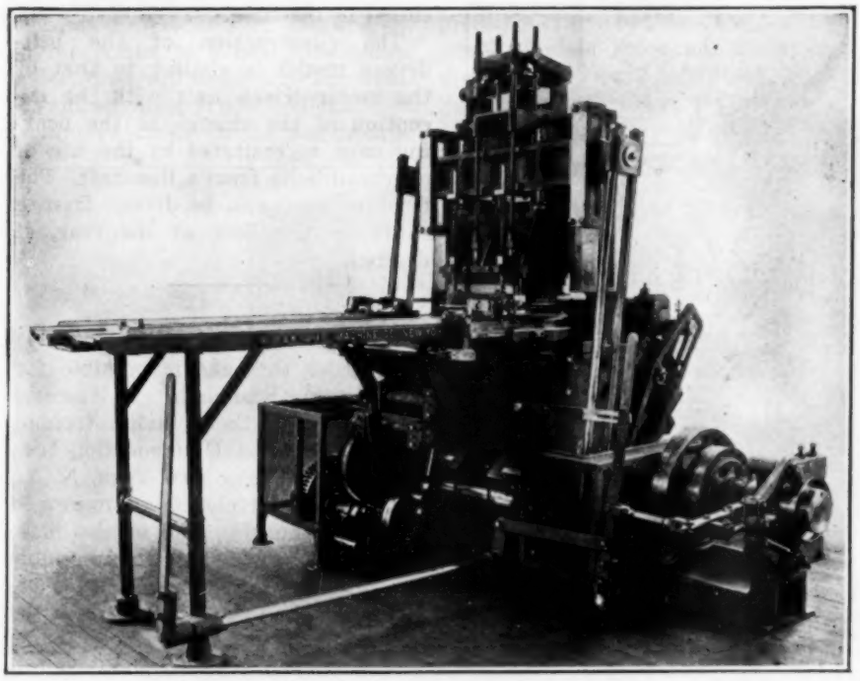
Bausch & Lomb "Telemagnifier"

a recent product of the Bausch & Lomb Optical Co., Rochester, N. Y. It is especially adapted for reading such instruments as thermometers, gages and dials, or the observing of parts of the machines, when the object is from 30 in. to 30 ft. from the observer.

The instrument has an exceedingly long focusing range and can be quickly adjusted for varying distances. It is a prism glass giving magnifications from six to nine diameters, depending on the distance. The device is small and compact so that it can be easily used with one hand and can be carried in the pocket.

Ams No. 403 Combination Blanking and Edging Press

The Max Ams Machine Co., 101 Park Ave., New York, N. Y., has recently added to its line of sheet-metal forming machines the No. 403 combination blanking and forming press shown in the accompanying illustration. This is a double-purpose machine and is designed to automatically accomplish work that formerly required two machines and two or more operators.



Ams No. 403 Combination Blanking and Edging Press

The machine illustrated is equipped for blanking and forming body sections of tubs and pails in consecutive operations, but with other equipment it is capable of performing similar operation on other work of a like nature. Only one operator is required and he has only to place the metal sheet on the feed table against the back gage. From this point on the action is completely automatic. A 72x27-in. sheet can be handled automatically, and in the case illustrated this size sheet provides six blanks.

The machine consists of an upright blanking press and a 45-deg. inclined forming press, both receiving their reciprocating motion from the same shaft. Twin gears with eccentrics attached drive the blanking press crosshead, the forming press slide being actuated by cranks and pitmans inside the housings. The machine is double back-geared and is provided with an Ams friction clutch controlled by means of two hand levers. It can be arranged for either belt or motor drive.

After the metal sheet is placed against the back guard, it is brought forward at the proper time into the path of the gripper feed. The grippers deliver the sheet to the blanking die, spacing it accurately, and after the last blank has been cut the scrap is ejected from the rear of the machine by means of rollers. The blank after being cut from the sheet is pushed through the blanking die to an inclining device.

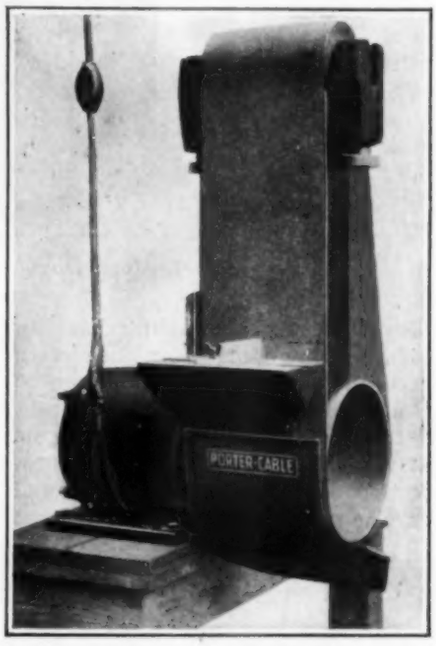
The inclining mechanism holds the blank by means of suction cups and swings it into alignment with the top of the forming die at an angle of 45 degrees. A reciprocating feed slide takes the blank from the inclining device and delivers it to the forming die. At the completion of the forming operation the finished blank is automatically ejected.

A vacuum pump for the suction cups of the inclining device is connected directly to the machine. The feeds are so constructed that the sheet is accurately spaced while the blanks are being cut, and the blanks are positively delivered and positioned at the forming die. With this machine it is possible to cut within $\frac{1}{8}$ in. of the edge of the sheet and a considerable saving in material is therefore possible. The weight of the machine is approximately 17,000 lb., and the production is about 35 blanks per minute.

Porter-Cable 6-In. Belt Sander and Grinder

A small size belt sander and grinder has recently been placed on the market by the Porter-Cable Machine Co., 1708 N. Salina St., Syracuse, N. Y. The grinding bed of this machine is 6x18 in. in size, and the entire device is small enough to be conveniently portable.

The grinding bed may be placed in a vertical position, as shown in the accompanying illustration, or in a horizontal position if required by the work to be done. The belt is driven by a $\frac{1}{2}$-hp. motor direct-connected to the $7\frac{1}{2}$-in. driving pulley. The adjusting screws for the idler pulley are located at the side of the bed so that they do not interfere with the changing of belts. Belts of various kinds may be used, so that the machine is adaptable for work on wood, metal, horn, bone and other materials.



Porter-Cable 6-In. Belt Sander and Grinder

The table is equipped with an angle gage that may be removed when the entire surface of the table is needed for the work. The dust hood is also easily removed. The driving motor runs at 1,725 r.p.m., giving a belt speed of about 3,300 ft. per minute.

Gardner Double-Spindle Polishing Lathe

A recent addition to the line of grinding and polishing machinery manufactured by the Gardner Machine Co., Beloit, Wis., consists of the No. 3-D double-spindle polishing lathe, of which the motor-driven model is shown in the accompanying illustrations. The machine has two independent spindles in line with each other and these spindles can be run at different speeds, if desired.

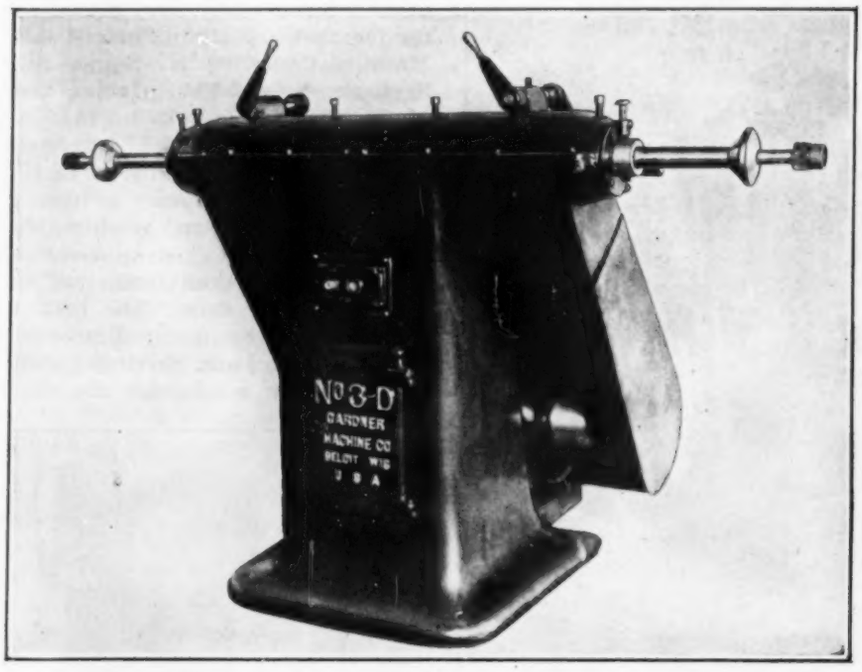


Fig. 1—Gardner Double-Spindle Polishing Lathe

In the motor-driven model the driving motor is mounted on a projection of the base at the rear and carries a pulley at each end of the armature shaft. The spindles are fitetd with tight and loose pulleys and are belted to the motor pulleys. The spindle speeds are regulated by the size of pulleys fitted to the motor shaft, the speed of either spindle being adjustable independently of the other. The lower halves of the spindle bearing housing are located in the top of the pedestal of the machine and a separate cap for each housing is provided.

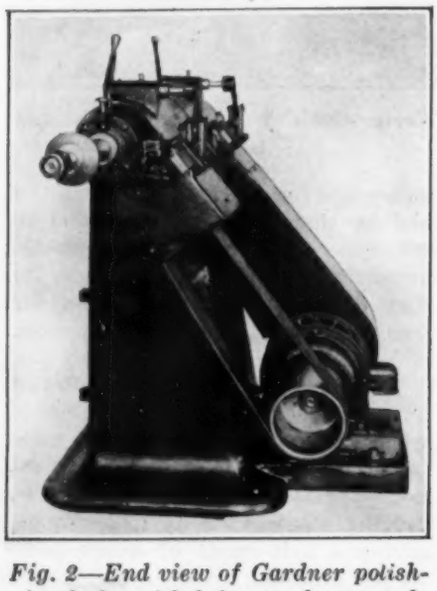


Fig. 2—End view of Gardner polishing lathe with belt guard removed

The bearing housings are bored after the caps are fitted in place to obtain the required accuracy, and the use of separte caps for each spindle makes it possible to disassemble either side of the machine completely without disturbing the other or interfering with its operation. The spindles are mounted in high-grade ball bearings enclosed in dust-proof containers, the bearings being lubricated from ample reservoirs in the housings.

A spindle locking device consisting of a button-head pin arranged to enter holes in a collar on the spindle, is provided to hold the spindle stationary when changing wheels. Hardened steel safety spindle nuts are provided for holding the wheels in place.

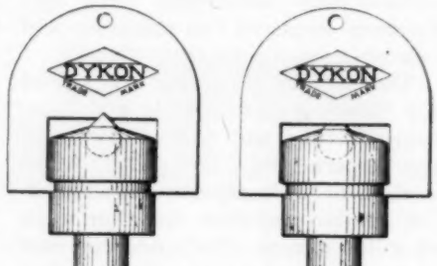
A sliding belt shifter is built into the machine, the operating lever being located in a convenient position for the operator. The upper portion of each belt guard is a part of the base casting and the remainder of the guard is constructed of sheet metal. The motor is mounted on a sliding base to take up the stretch of the belts, and a 5-hp. motor running at about 1,700 r.p.m. is recommended. The motor is controlled by a Cutler-Hammer push-button station on the front of the pedestal, the switch proper being enclosed in the base.

The construction of the belt-driven model is similar to that of the motor-driven unit with the exception of the change in the bearing caps necessitated by the use of overhead belts from a lineshaft. The machine may also be driven from a shaft on the floor at the rear, if desired.

"Dykon" Diamond Gage

In order to make it possible for commercial diamonds to receive proper care without undue trouble, the Joyce-Koebel Diamond Co., Inc., 39 West 32nd St., New York, N. Y., has recently developed an improved diamond mounting and is also marketing a gage by which it is possible to tell when the diamond needs resetting. The gage is designated the "Dykon" diamond gage.

The body of the diamond mounting is grooved after the diamond is set, as shown at *A* in the accompanying illustration, the groove being so positioned that the diamond projects above the gage by the amount of wear to be allowed. When the diamond has worn to such an extent that the gage will pass over it, as shown at *B*, it should be used no more until reset. Each time the diamond is reset the holder is regrooved to make the gage fit the diamond in its new position properly.



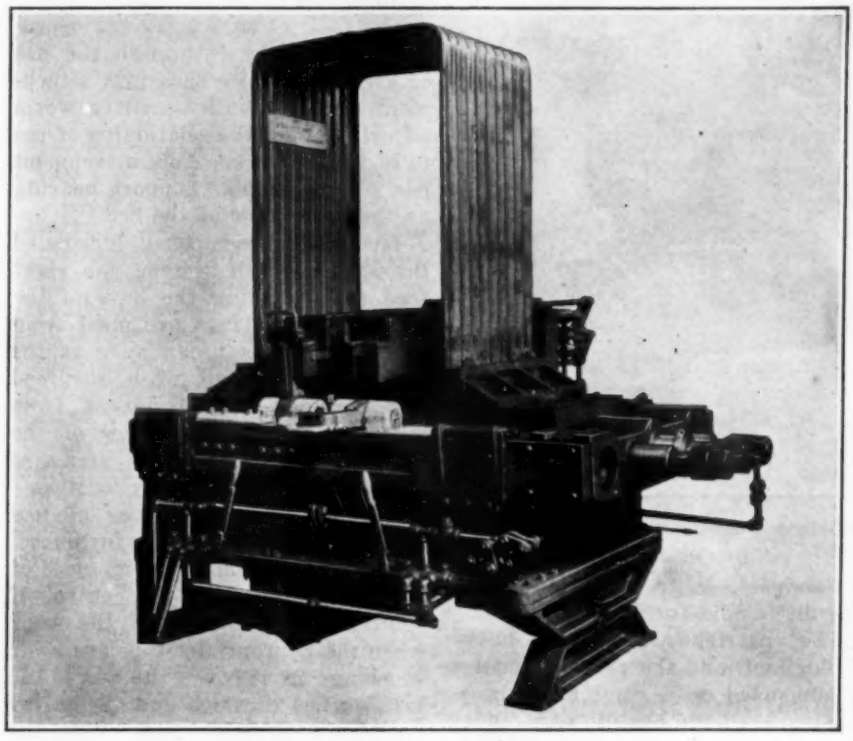
"Dykon" Diamond Gage

It is stated that a diamond that has been used beyond the depth specified by the gage, and worn to a

flat surface, requires a greater pressure to dress a grinding wheel, and the consequence is that a greater amount of heat is generated increasing the liability of the diamond to break and disintegrate. Tests have shown that the life of these diamonds may be increased by as much as 100 per cent by proper care and use. The gage should secure the greater part of the surface that might be wasted by improper use.

Federal Heavy-Duty Butt Welder

A recent product of the Federal Machine & Welder Co., Dana Ave., Warren, Ohio, is a heavy-duty butt welder, designed especially for welding ribbed steel truck bodies. The machine is shown in the accompanying illustration with one of these parts in position for welding.



Federal Heavy-Duty Butt Welder

The machine is equipped with a 200-kva. transformer for operation from a 220-volt, 60-cycle, a.c. circuit and has sufficient capacity to produce a weld in stock 30 in. wide by ½ in. thick. It is designed to stand a continuous, heavy overload and hard service. Its location and construction have been so arranged that it is impossible for the burnt metal from the flashing weld to get into the transformer.

Instead of having short bearings, the movable slide is carried on heavy steel bars extending the full length of the machine, the bearings being located at the ends of the bars so that the effective bearing length is 6 ft. This makes the machine rigid under the heavy strain of welding large cross sections where the full pressure is applied, and the bearings are far enough from the flash so that dirt does not work into them.

The machine operates from a hydraulic accumulator system at from 1,000 to 1,200 lb. per sq.in., the total pressure exerted being 40 tons at the lower pressure. The clamping eccentrics are operated through heavy pinions and racks, the work being clamped with a pressure of 35 tons on each jaw.

The main electrodes are 4x1½-in. copper bars 30 in. long, and are held firmly in position on the lower electrode support. A continuous stream of water passes through the electrodes during the welding operation. The main electrode supports are made of high-grade gun metal.

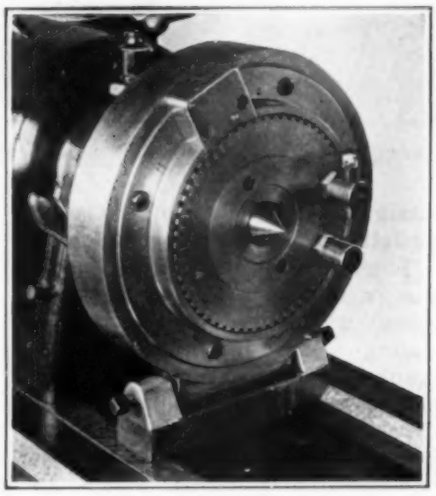
It is stated that a 30x½-in. weld is completed in 30 seconds from the time that the current is turned on, the actual cost of the current being 2¼ cents, based on a cost of 2 cents per kw.-hr. The machine weighs 16,000 lb. packed for shipment.

Speed-Reducing Faceplate for Pratt & Whitney Model B Lathes

For the purpose of obtaining very slow spindle speeds on its 16-in., Model B lathe, the Pratt & Whitney Co., Hartford, Conn., is now marketing the speed-reducing faceplate shown in the accompanying illustration. This device is especially adapted for use in relieving operations, in the cutting of screws with extremely long leads, and as an indexing faceplate.

The attachment incorporates a gear that can be attached to the spindle nose. Two planetary gears are carried on a separate plate that is fitted with a driving dog, these gears meshing with the gear on the spindle nose and a large internal gear which is held stationary by being clamped to the bed of the lathe. The mounting of the driving gear on the spindle nose does not interfere with the use of the regular center.

The device makes speeds as low as 2 r.p.m. possible and it is therefore especially useful for relieving work. It is stated that threads with leads as long as 12 in. have been cut with the aid of the attachment, using a feed of 0.002 in. and experiencing no trouble from chatter marks.



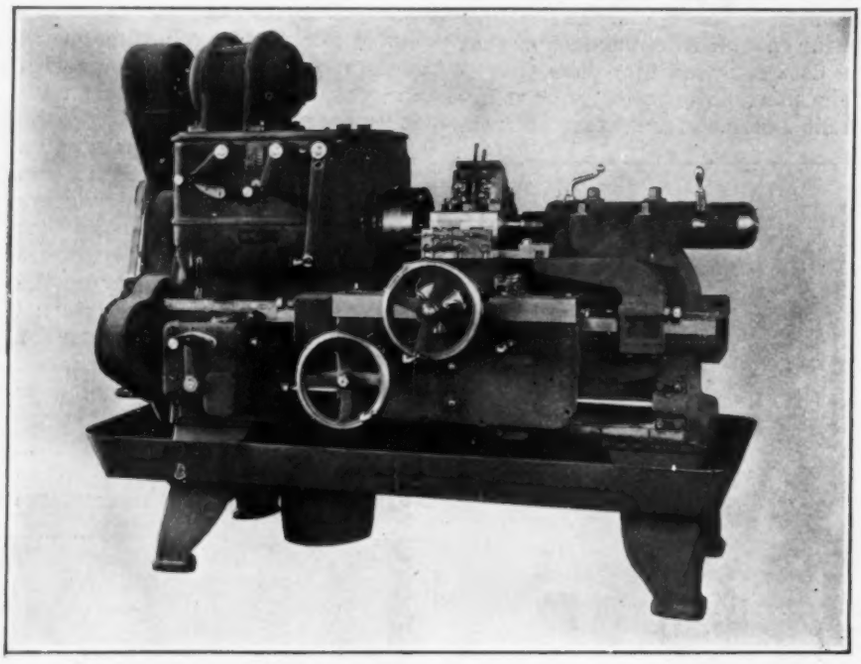
P. & W. Speed-Reducing Faceplate

The drive plate has 60 notches cut in its periphery, into any one of which a convenient pawl may be introduced for accurate indexing. This feature is valuable when multiple starts are required, as is usually the case with long-lead screws. The gearing may be locked, if desired, so that there will be no rotation of the drive plate, the device then functioning as a regular indexing faceplate.

Reed-Prentice No. 2 Production Lathe

The illustration shows the No. 2 four-speed production lathe recently developed by the Reed-Prentice Co., Worcester, Mass. The machine is designed for heavy duty service in automotive and general manufacturing shops and is equipped for straight, taper and form turning, drive with all gears running on ball bearings. The motors used range from 5 to 20 hp., depending upon the class of work.

The cam tailstock provides for quick withdrawal of the tail center as well as a fine adjustment of the center in the work. Quick loading



Reed-Prentice Production Lathe

straight and bevel facing, recessing and straight and form boring.

The headstock is of box construction arranged with four spindle speeds which are obtained through sliding gears positioned through crank handles conveniently located on the front of the headstock. The drive is through a disk clutch and brake located at the rear of the head and operated by a hand lever at the front of the headstock. This arrangement of levers provides for simple manipulation, while the disk clutch and brake give practically instantaneous starting and stopping.

All of the headstock gears are of hardened steel, and the driving gears to the spindle are of the herringbone type to provide for smooth power transmission to the spindle. All of the gear shafts in the headstock, with the exception of the spindle, run in ball bearings, while the spindle journals are hardened and ground and run in bronze bearings.

The headstock can be furnished with either belt or motor drive. The illustration shows it arranged for herringbone-gear-connected motor is thus possible. A hand clamp locks the tail spindle during operation.

The carriage is extra heavy throughout, and the carriage bridge is supported on a right angle bearing inside of the bed, directly under the front tool holder. The apron is arranged with independent power longitudinal and cross feeds, either of which may be engaged separately. Both the longitudinal and cross feeds are automatically operated and tripped in both directions, the direction of the feed being determined by the position of the hand lever projecting from the front of the apron. The changing from longitudinal to cross feed, and vice versa, is obtained by a pull gear controlled from a handle protruding from the front of the apron. The operation of the automatic trips is simple and dependable, and with the use of positive bed and cross stops, accurate positioning of the tools may be obtained. As will be seen in the illustration, both the rack pinion and cross feed hand wheels are large in diameter. The latter is arranged with a large micrometer dial.

With the standard gears of the feed works arranged in a simple order, the four speeds obtained by the use of the feed box are 0.010, 0.015, 0.020 and 0.025 in., and by compounding these standard gears regularly furnished with the end works, feeds of 0.020, 0.030, 0.040 and 0.050 in. can be obtained. This gives seven different feeds. By furnishing special gears for the end works, any feeds up to 0.050 in. may be obtained. The changing of the feed in the gear box is accomplished through sliding hardened-steel gears operated by a crank handle at the front of the box.

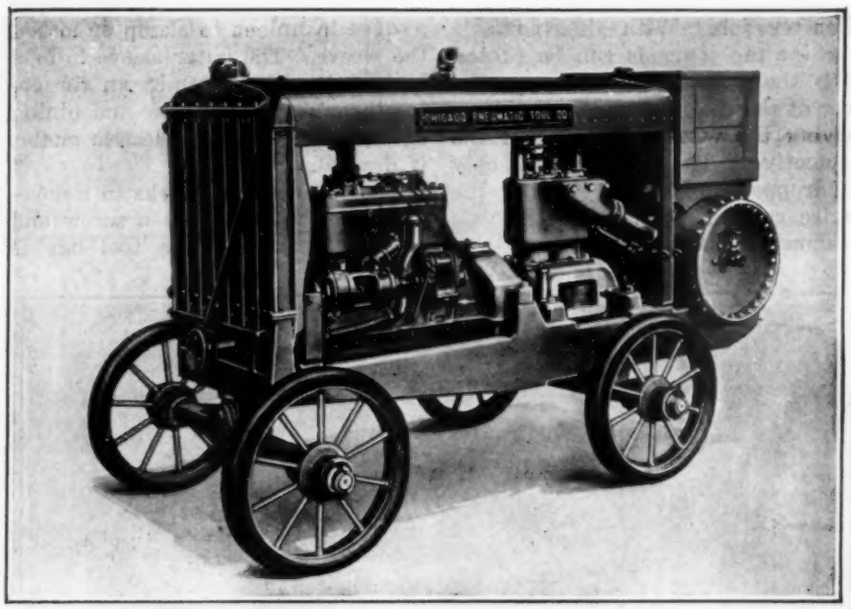
The facing and chamfering operations are obtained through the use of a Reed-Prentice back arm attachment provided with sensitive worm adjustment for the relationing of the tools to the work. This attachment has a long angular support bearing on the lower part of the bed.

The entire headstock is lubricated through a splash system, the sight feed oiler showing the level of the oil. Apron bearings are oiled from pipe connections to an oiler at the top of the carriage, while the feed box bearings are lubriacted from pipe connections to the top of the box. Other bearings are arranged with oil cups conveniently located.

Various sizes and types of tool holders and drivers can be furnished. The lathe is automatic in its cycle of operations, including the control of lengths and diameters of the work when the appropriate stops are used. It swings 22 in. over the ways, 12¾ in. over the carriage and 12½ in. by the back arm attachment. With the 7-ft. bed the distance between centers is 24 in. This distance can be increased as the bed is lengthened to meet the customer's requirements. The gears in the headstock are made to suit the spindle speeds required by the customer's work.

Chicago 100-Ft. Portable Air Compressor

A portable, gasoline engine driven, air compressor with a capacity of 100 cu.ft. of air per minute has recently been placed on the market by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y. The machine is adapted for use in a shop where isolated work might require an auxiliary air supply or where the small amount of air required might not warrant the installation of a continuously running compressor of



Chicago 100-Ft. Portable Air Compressor

larger capacity. The machine will operate two riveting or calking hammers or other tools with similar air requirements.

The compressor is of the vertical, single-acting, duplex type equipped with Simplate inlet and discharge valves. A differential unloader regulates the air supply and an auto-pneumatic throttle provides additional fuel economy by slowing the engine to idling speed during the unloaded periods and speeding it up just before the load is resumed. The compressor is lubricated by means of a splash system.

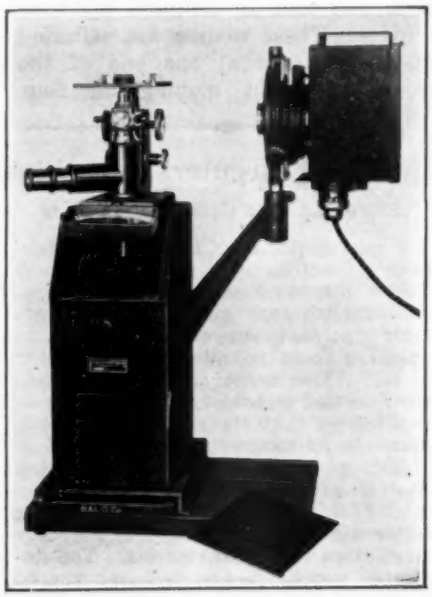
A flexible coupling, that can easily be disconnected for starting, connects the compressor directly to a heavy-duty four-cylinder gasoline engine. A radiator of large capacity provides the cooling means for both the engine and the compressor. A cast-steel deck serves as the base for the engine, the compressor and the air receiver, and a gasoline tank is carried in a section of the tool box.

The complete unit is supplied in the regular steel-wheeled or rubber-tired model, the rubber-tired trailer type, or mounted on a 1-ton Ford truck chassis.

Bausch & Lomb Simplified Metallographic Equipment

For general routine metallographic inspections, the Bausch & Lomb Optical Co., Rochester, N. Y., is now marketing the simplified metallographic equipment shown in the accompanying illustration. Such inspections seldom require magnifications above 200 diameters, and hence do not require the expensive parts which are necessary in research outfits where high-power magnification is required.

The simplified equipment is a compact unit with all of the parts mounted on one base and with the light source in a fixed position. The equipment includes an inverted microscope, a camera and a special ribbon filament illuminant. It is said to be easy to operate, portable, and especially suited for low power work. The magnifications given by this apparatus vary from 64 to 200 diameters.



Bausch & Lomb Simplified Metallographic Equipment

Gray Planer Tool Models

The G. A. Gray Co., Cincinnati, Ohio, has developed a series of planer tool shapes recommended for use on the planers of its manufacture and is now marketing a number of aluminum models to be used as guides in forging and grinding the tools. The models are mounted in a convenient rack which may be hung in the shop. An instruction chart is provided.

The complete set includes 16

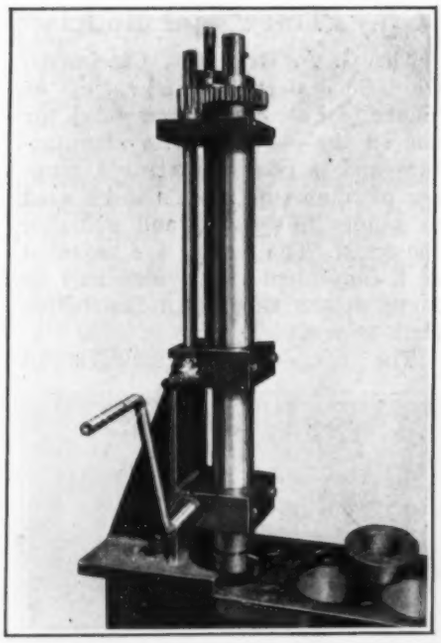
Gray Planer Tool Models

models and is shown in the accompanying illustration. Shapes 1, 2 and 3 are roughing tools for use on cast iron, and 4 and 5 are right- and left-hand roughing tools for steel, respectively. No. 6 is a square-nosed roughing tool for cast iron and No. 7 is a square-nosed finishing tool for the same material. A goose-neck finishing tool occupies position No. 8 and the rest are tool shapes used in cutting dovetails.

"Do-Mo" Portable Cylinder Boring Machine

The E. H. Odom Bros. Co., Inc., Atlanta, Ga., has recently placed on the market a portable cylinder boring machine, designated "Do-Mo." The device is arranged to be attached to the motor while it is in the chassis, is self-contained on its own base, and does not depend on the old cylinder bore for its alignment.

The boring bar is carried in a centering head that aligns it with the cylinder bore. The tools are double-end cutters made to standard sizes,

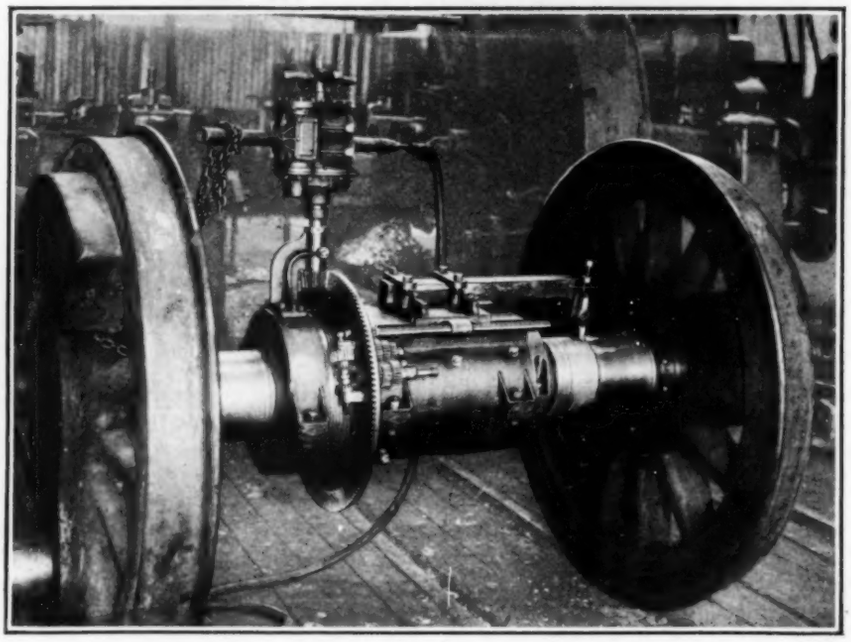


"Do-Mo" Portable Cylinder Boring Machine

so that no adjustment of cutting tools is necessary and a skilled operator is not required. The boring bar can be withdrawn from the bore without rotating. The feed is automatic and can be engaged at will. The machine may be driven by hand or by an electric motor, as desired.

Marsh Portable Journal Turning Machine

The Marsh portable machine for turning locomotive axle journals with the wheels mounted is now being marketed by Chester B. Blakeman, Atlanta, Ga. This operation usually requires a lathe large enough to swing the wheels, and this means the use of the large wheel lathe in the railroad shop for a small diameter job. With this portable machine the journals can be turned with the wheels and axle on the floor of the shop, or even without removing the wheels from under the locomotive. The wheels need only be dropped sufficiently so that the device can be mounted on the axle as shown in the illustration.



Marsh Portable Journal Turning Machine

The machine is composed of two principal parts, an inner sleeve which clamps on the center of the axle and an outer sleeve carrying the cutting tool and the necessary mechanism for revolving it around the axle. The inner sleeve is bolted to the axle at each end and is centered by four wedges. These wedges are actuated by a large nut at one end of the sleeve, the nut moving all four wedges in unison to clamp or loosen the sleeve. The outer sleeve is held by bolts, and is driven by an air motor through a bevel gear and pinion as indicated or by an electric motor, if desired.

The tool carriage works in a dovetail slide, being fed by a screw and suitable gearing. The tool bar is 2 in. square and long enough to turn a journal 14 in. in length. The tool holder swivels to enable the tool to turn close to the hub liner. The feed is obtained by the large worm at the left and can be reversed by the bevel gears and a clutch, in the usual manner. Cuts ½ in. deep with a feed of $\frac{1}{16}$ in. can be taken without chatter, although the machine can be easily handled by two men.

Sending Spanish Circulars to Latin America

HECTOR LAZO in *Commerce Reports*

American exporters have, for some years, endeavored to meet the demand throughout Latin America for catalogs and circulars in Spanish. Large sums of money have been expended, and yet, almost daily, there come to the attention of the Bureau of Foreign and Domestic Commerce examples of catalogs, circulars, and Spanish advertising (in Latin American newspapers and magazines) that go a long way toward defeating their own ends by injudicious or mistaken choice of words.

In many instances the desire to express the same sentiment in Spanish as in English leads to "dictionary translations" which result, in not a few cases, in ludicrous or meaningless phrases.

A case in point is that of a manufacturer of automobiles, advertising in a Cuban magazine of large circulation. The English copy given to the "translator" pointed out that the cars in question "cost no more than a motor cycle." The actual Spanish translation, printed in bold type, told prospective buyers that the car "is not worth more than a motor cycle."

A large manufacturer in the United States, after translating his catalog into Spanish, had his usual covering letter put into the same language for circulation in Latin America. The desire to put the prase "We ask you to accept it [the catalog] with our compliments" led to a meaningless sentence in Spanish, as this well-known stock expression in our own language has no literal counterpart in Spanish.

It seems worth while for exporters to note that in Spanish one does not "acknowledge receipt of your letter of the third inst." but rather "takes pleasure in announcing that we have in our hands your welcome communication of the third of the current month." There is no object in trying to have Latin Americans change their business methods and tastes to suit ours. The Latin American is accustomed to being addressed as a valued customer, even though his account be but a small one; he likes to receive courtesies in letters and in circulars and is quick to resent what may appear to him as a lack of courtesy or dignity.

News of the Week

Oil Dilution, Transmissions and Air Cleaners, Main Topics of S.A.E.

Summer session is again held at Spring Lake, N. J.

Spring Lake, N. J., was again the scene of the summer meeting of the Society of Automotive Engineers from June 24 to 27, and while the total attendance was not as large as last year, this was not due to a smaller number of companies being represented but to fewer men coming from each organization. The weather was fine, except for a heavy shower and the program gave ample time for sports outside of meeting hours.

After a brief address of welcome President Crane opened the convention with the session on Riding-Comfort, papers being presented by S. P. Hess, A. H. Lockwood, L. B. Kimball and J. A. C. Warner. The subjects treated included spring design, a riding quality indicator and the result of research along these lines. The semi-annual business meeting was held in the evening at which much interesting information concerning the welfare of the society was given to the members.

Testing and Purifying Crank Case Oil

The problem of oil dilution occupied the sessions of the second day, T. J. Litle, Jr., presiding in the morning and J. H. Hunt in the evening. The morning papers were "Better Crank Case Draining Service," by C. M. Larson; "Consumption and Dilution of Engine Oil," by Neil MacCoull; "Water in Crank Case Oils," by A. Ludlow Clayden, "Corrosion in Automotive Engines," by H. C. Moughey; and "Microscopic Studies of Contaminated Oils," by G. A. Found. All the papers were discussed very freely, many points of view and much valuable information being brought out. The use of a mixture of castor oil with regular engine oil as a means of partially preventing dilution, was advocated in a discussion read by F. E. Moscovics for an absent member. It was pointed out that as oil dilution was more a matter of conditions than of mileage, the usual practice of changing oil after every 400 to 1,000 miles was not enough in many cases and wasteful in others. Use of the choke in starting causes more dilution than miles of running at ordinary temperatures.

In order to know the condition of the oil, gages have been provided for use by the driver or garage man. One is a special hydrometer which shows the density of the oil and can be set to zero for any special oil, showing the quality when tested from time to time in terms of Good, Fair, Poor and Danger. Another gage allows the comparison as to viscosity with a standard oil. As the wear of bearings depends so much on the quality of the lubricant, it is highly important that the oil be changed before it becomes diluted more than 25 per cent. Dirt and foreign particles in the oil were also considered. The similarity of subjects being discussed by the S. A. E. and the Democratic presidential convention in session at the same time, particularly that due to contamination, was humorously brought out by Mr. Moscovics.

At the evening session R. L. Skinner presented an excellent paper on the "Rectification of Diluted Crankcase Oil," in which he showed what had been accomplished by his device for this purpose, which is now being adopted by some of the more progressive builders of automobiles. This device takes the oil from the cylinder wall below the lowest piston ring and passes it through a retort heated by exhaust gases, which vaporizes the gasoline and water and allows them to escape into the intake to be used in the cylinder, while the purified oil is returned to the crank case. J. O. Eisinger presented a progress report on "Co-operative Fuel Research." Simultaneous meetings of both the lighting and springs division, were also held.

Standards Committee Meets

The meeting of the Standards Committee was well attended. The agricultural power equipment, ball and roller bearings, lighting, non-ferrous metals, parts and fittings, screw thread and spring divisions were represented. Proposed standards for tube fittings and high (or thick) nuts brought out considerable discussion, which is the life of any meeting, and in which the S. A. E. is particularly fortunate. The lighting committee made a very complete recommendation as to both single and double circuit lamp connections and also presented proposed standard gages for these fittings so as to secure greater interchangeability.

Action on the various proposals was as follows: The report of the Agricultural Power Equipment Division was accepted except for the recommendations regarding belting which were withdrawn. The report of the Ball and Roller Bearings Division was accepted as was also the case with those of the Non-Ferrous Metals and Screw Threads Divisions. A minor change was made in the report of the Lighting Division before it was accepted. Quite a number of changes were made in the report of the Springs Division. The report of Parts and Fittings Division was accepted by the whole Standards Committee but one section was rejected by the Council because of a constitutional provision prohibiting the setting of standards on patented articles. With this change the whole report was accepted by the Society and will now go to the members for letter ballot.

New Transmissions and Air Cleaners

The transmission session was particularly interesting, both to drivers of automobiles and machine builders using variable speed devices of any kind. The papers were "Automobile Transmission Tendencies," by J. M. Nickelsen; "A Positive Mechanical Continuous-Torque Variable-Speed Transmission," by E. B. Sturges; and "Constant Mesh Transmissions," by W. A. McCarrell.

The last day was devoted to an Air-Cleaner session at which papers were presented by L. L. Dollinger, P. S. Tice, A. R. Squyer, Prof. A. H. Hoffman and C. P. Grimes, each dealing with different phases of the problem or different methods of meeting it. All engineers are beginning to recognize the wear in cylinders and other parts due to dirt and dust being taken into the carburetor intake and many cars are now being equipped with air-cleaning devices. The whole convention was in fact devoted to subjects which directly tend to lengthen the useful life of automobiles in ways that are bound to increase the difficulties of selling both new and used cars. But the industry has now reached the point where service is an outstanding feature and on which its future depends. The offering of an amendment to the constitution so that engineers connected with operation and maintenance will be included in the society is an evidence of the trend.

Franklin Resumes Assembly

Assembly work was resumed last week by the Franklin Automobile Co. following the completion of the inventory for which production was temporarily halted a few weeks ago. Franklin officials state that the number of completed cars on hand is normal.

Retail deliveries by dealers are running at the rate of better than 800 a month. With low stocks in dealers' hands, orders at the factory are on the increase. It is understood that production will be increased as rapidly as conditions warrant. Although the company is not advertising for help, men are being taken on as occasion requires. The employment division, on June 21, reported 100 additional men added to the payroll.

A.S.T.M. Holds 27th Annual Meeting at Atlantic City

F. M. Farmer of New York new president

The twenty-seventh annual meeting of the American Society for Testing Materials was attended by nearly 700 members and others at Atlantic City, June 23-24. This large attendance is a good indication of the increasing importance of the work that the society is accomplishing, and an evidence of the appeal that the excellent program made to the membership.

As usual, the meeting was characterized by the ability that this society has to get concrete results from its deliberations, these results being in the form of new standard and tentative specifications for various materials, together with changes and additions in methods of testing. On account of the multiplicity of papers and wide variation in subjects many of the sessions were divided so that two meetings were held at one time.

A paper, "The Carrying Capacity of Ball Bearings Made of Stainless Steel," presented by Axel Hultgren of Gothenburg, Sweden, at the first session showed that there is little hope that this material can be used for rust-resisting ball bearings. The tests summarized showed that the carrying capacity of stainless steel bearings was only from 10 to 20 per cent of that of the ordinary ball bearings. J. B. Johnson and S. A. Christiansen, Engineering Division, Air Service, McCook Field, Dayton, Ohio, described the results of laboratory and engine tests of steels proposed for valves at high temperatures. No materials have been found to fulfill all the requirements of this service but a cobalt-chronium and a silicon-chronium steel most closely approach the perfect air-craft engine valve steel, although both have serious limitations.

What Is Steel?

With past-president A. A. Stevenson presiding, the seventh session on Wednesday was opened by the annual address by the president of the society, Guilliaem Aertsen. Mr. Aertsen chose "What is Steel?" for his subject, but confessed his inability to answer the question concisely after an illuminating historical and technical discussion.

The officers of the society for the coming year will be F. M. Farmer, chief engineer, Electrical Testing Laboratories, New York, N. Y., president; and J. H. Gibboney, chemist, Norfolk and Western R.R., Roanoke, Va., vice-president. The newly elected members of the executive committee are William Campbell, Howe professor of metallurgy, School of Mines, Columbia University; A. E. Jury, United States Rubber Co., New York, N. Y; Anson Marston, dean of division of engineering, Iowa State College, Ames, Iowa; and John A. Mathews, Crucible Steel Co., New York, N. Y.

A new and encouraging note was sounded at the Thursday morning session by Thomas H. Wiggin, Consulting Engineer, New York City, in his paper, "How Shall the Benefits of A. S. T. M. Standardization be Secured to the Small User?" It is generally acknowledged that, although the highly advantageous standard specifications and other data prepared by this society are available to everyone, it is only the comparatively large user who can take full advantage of them. After reciting the disastrous results of the use of improper materials by some small concerns that were financially unable to perform adequate tests on purchased materials, Mr. Wiggin made an effective plea for concerted endeavor by the society to bring the benefits of its efforts to the small consumer. Further discussion seemed to show that the cooperation of reputable manufacturers and the dissemination of facts concerning the standard specifications of the society among consumers are necessary steps.

Reports of Technical Committees

Much of the time of each session was taken up by the reports of the various technical committees. These reports showed without doubt that material progress is being made by the society in its efforts to standardize and make effective in a practical way the testing of materials for industrial uses.

The tenth session on "Methods of Testing and Nomenclature" included committee reports on definitions and methods of testing together with a paper on "Tension Tests of Thin-Gage Metals and Light Alloys," by H. A. Anderson. The final sessions of interest to the machinery industries were on "Magnetic Analysis and Fatigue of Metals" and "Wrought and Cost Iron," respectively. Committee reports on malleable casting and cast iron specifications were a notable feature of the latter session.

Railroad Briefs

It seems to be a settled fact that the Van Sweringen interests of Cleveland have secured sufficient Erie stock to give them practical control.

F. H. Shepard, director of heavy traction of the Westinghouse Electric and Mfg. Co., in referring to the need of electrifying the roads said that electrification will have to be brought about, not especially to save fuel, but to accomplish traffic movement that is difficult or impossible with steam.

Class I roads installed 11,364 freight cars and 153 locomotives during May.

The Pullman Co. recently announced the segregation of its manufacturing properties and the organization of a new $50,000,000 corporation, known as the Pullman Car Manufacturing Corp. which has taken over the manufacturing plants at Pullman, Ill., and at Michigan City, Ind., and is now in operation.

The D. T. & I. is to be electrified. The first electric locomotive, designed by Ford engineers, will be built in the D. T. & I. shops at River Rouge. Construction will be started July 15.

Class I roads reduced their labor bill by $50,000,000, when compared with the bill for the first quarter of 1923. The savings are attributed largely to the good condition of equipment and recovery from the effects of the shopmen's strike.

The net income of the Michigan Central in 1923 was $14,176,448 ($75.66 per share of outstanding capital stock). In 1922 the figures were $12,818,270 and $68.41.

Since the beginning of the current year the Canadian Pacific Ry. has added 22 passenger cars, 545 freight cars and 15 locomotives of the Mikado type.

Motor Production in May

Production of passenger automobiles in May totaled 279,439 cars as compared with 337,045 in the previous month and 350,460 last year while truck production totaled 33,374 cars in May as against 36,154 in the previous month and 43,730 a year ago. Manufacturers sales of passenger automobiles during April, based on value, as deduced from May internal-revenue-tax collections, increased over the preceding month but were below last year while the total value of truck sales declined from both comparative periods. Production of pneumatic rubber tires declined in May from the previous month and a year ago. Shipments of tires declined from these same periods, as did manufacturers' stocks.

Persons-Arter Co. Changes Name

The Persons-Arter Machine Co., of Worcester, Mass., has changed its name to the Arter Grinding Machine Co. The officials of the company remain the same as in the past two years and no change has been made in the stockholding interest.

The change of name is due to the severing of Charles A. Person's connection with the firm about three years ago, both as an officer and stockholder, and to the belief that the new name will be more descriptive of the line of manufacture.

Pig Iron as a Business Barometer

If pig iron is still a fair barometer of general business, conditions are not so bad as some would have us believe. Business in fact, should be fairly good, especially in general machinery lines. For pig iron continues active, orders ranging from 3,000 to 10,000 tons each being rather numerous according to Rogers Brown & Company.

Reports from other quarters, such as the Pittsburgh district, give orders more active and state that consumption is exceeding production at the present moment. Consumers' stocks are said to be low and some of the large companies, such as General Electric and American Locomotive are in the market for iron.

Norwalk Iron Works Sold

The plant, equipment and good will of the Norwalk Iron Works Co., of Norwalk, Conn., have been sold to Charles B. Stanley, a Cleveland banker. The purchaser is a member of the Cleveland banking firm of Stanley & Bissell. His purchase was in the interest of bondholders, whose petition to foreclose a mortgage on the Norwalk properties forced the company into bankruptcy last December.

Immediately following the purchase by Mr. Bissell he transferred the properties to the Norwalk Co., a new corporation which will operate the plant in the production of its familiar products.

Directors of the new corporation are Charles B. Stanley, Howard N. Bissell and Geo. F. Griffith of Cleveland; F. R. Hickman and E. H. Havens of Bridgeport, and R. C. Witmer and T. H. Hermanson of Norwalk. These directors, at a meeting following the sale, organized with Mr. Havens as president; Mr. Hickman, vice-president and treasurer; R. C. Witman, secretary, and T. H. Hermanson, works manager.

Mr. Havens, president of the new company, was named receiver of the Norwalk Iron Works Co. last December when Mr. Hickman, who has been prominent in financial circles in Buffalo and Bridgeport, was appointed general manager. The bondholders who had foreclosed decided as a result of the growth of business under the receivership that a reorganization was desirable. The transactions of yesterday are a result of their decision to continue the business.

The Norwalk plant was begun in 1867, when the original Norwalk Iron Works Co. was incorporated to build engines and compression machinery. The company built its first air compressor in 1876. One of its latest machines is a compressor for helium gas in the Lakehurst, N. J. plant of the United States air service, where the government's dirigibles are housed.

The new company has announced that it will continue the Norwalk plant along existing lines, with a general broadening of its output, to include the complete range of air and gas compressors, and a further development of its service of machines already in the field.

Three Technical Sessions at New Haven Exhibit

The fourth annual machine tool exhibit, to be held in Mason Laboratory, New Haven, Sept 15 to 18, 1924, will devote its four days entirely to machine-shop-practice problems.

Three technical sessions are being planned for the afternoons of Sept. 16, 17 and 18, to be devoted to three phases of machine-shop-practice problems: research, standardization, and general problems. The feature session of the week, to be held Monday night, Sept. 15, will be addressed by a speaker of national reputation, on problems affecting the machine industries, while the session the following night will be on education and training for the machine industries, questions that are receiving much attention at this time.

Papers to be presented at the technical sessions will be available in printed form in advance of the meeting so that profitable discussion will be assured.

Latest reports from New Haven are to the effect that eighty-five per cent of the exhibit space has already been taken.

Automotive Exports Still Expanding

April continued the steady increase in American automotive exports which has been uninterrupted since the first of the year. The total value of automotive exports from the United States during April was $23,829,150, as shown by Department of Commerce figures, compared with $21,226,273 in March, $19,566,226 in February, and $18,465,202 in January. During the first four months of 1924 the total value of automotive exports has been $83,086,851.

Shipments of both cars and trucks increased materially, not only over the preceding month, but over April, 1923, as well. Motor cycles also moved up in the export table as compared with March, although still falling short of the figure for April, 1923. Parts of motor vehicles exported in April this year were valued at over a million dollars more than those in March, and four million dollars more than in April last year. Automobile engines shipped in April, however, were less than half of those in March and less than a quarter of those in April last year.

Population of U. S. Gains 1,943,000 in Year

The population of the United States totaled 112,826,000 on January 1, 1924, according to estimates announced today by the National Bureau of Economic Research, Inc. This compares with 110,883,000 on January 1, 1923, and the census count of 105,711,000 on January 1, 1920.

The most remarkable gain was recorded in the last half of 1923, the net increase being 1,162,000, a growth greater than in any other half year during the last two decades, and probably greater than in any six months period in the nation's history. The gain for the entire year was 1,943,000.

The National Bureau of Economic Research estimates the population of the Continental United States for each half year since January 1, 1920, to have been approximately as follows:

January 1, 1920	105,711,000
July 1, 1920	106,422,000
January 1, 1921	107,575,000
July 1, 1921	108,533,000
January 1, 1922	109,298,000
July 1, 1922	109,898,000
January 1, 1923	110,883,000
July 1, 1923	111,664,000
January 1, 1924	112,826,000

All the figures after January 1, 1922, are necessarily tentative, for the Bureau of the Census has not as yet published complete monthly data for births and deaths covering the periods since 1921.

Chile Buying Much Machinery

Exports of industrial machinery from the United States to Chile more than doubled in 1923, according to the Department of Commerce. In 1922, Chile was sixteenth among the countries of the world as a market for American machinery; in 1923, it rose to tenth position, outranking China, Brazil, and the Philippines—markets ranking directly after Chile in the order given. Chile is now second only to Argentina in importance among South American countries as a market for American machinery.

The values of American machinery shipped to Chile in 1922 was $1,171,843, according to the U. S. Customs returns. In 1923, it was $2,575,942—an increase of nearly $1,500,000. The greatest gain was shown by construction machinery.

More Shops and Equipment for the Union Pacific

The railroad business in the west is good enough, in the opinion of Carl R. Gray, president of the Union Pacific Ry., to spend over $29,000,000 during the present year. This is a small increase over last year's expenditure. The largest single item, $7,966,978, is for branches and extensions, a very encouraging sign. New equipment will include 35 locomotives of Mallet, 2-10-2 and mountain types, together with 500 steel tank and other cars.

New shops and additional shop equipment will use over 2½ million dollars, all of which will make for more economical maintenance and insure repairs being made more expeditiously. This evidence of faith in the continued growth of business in the western part of the country should help to stiffen the backbone of some of those who fear to increase facilities at this time. The attitude of the Union Pacific may be at least partially responsible for the revival of inquiries for locomotives. One large system is asking for 50, a road in the southeast wants 25 and other inquiries bring the total up to well over 100 locomotives in all.

Demonstration of Community Advertising at Hull, England

The Lord Mayor of the City of Hull, England, invites the representatives of American machinery industries who will be attending the British Empire Exhibition in London to visit the old city of Hull. The city was founded in 1299 and at the time of the exhibition in London will conduct a practical demonstration of community advertising, the dates being from July 2 to 15, at Wembley.

The Canadian Customs Dept. has issued the ruling that no cold drawn steel is to be entered as shafting, unless to be used for shafting, and a declaration to that effect is to be placed on the entry.

Cold drawn iron or steel ½ in. in diameter or over, and not in the coil, is not considered to be wire.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price

Editor, *Commerce and Finance*, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

IT MAY not be so elsewhere, but here in New York the Democratic Convention continues to obscure business and until it is over the spirit of enterprise is likely to be restrained. But the nervous fear of Democratic radicalism that was in evidence last weeks seems to have disappeared and it is significant that where the markets have moved at all they have advanced.

The strength of corn and wheat has been especially impressive and in the national balance sheet the high prices at which corn has ruled for several months past will partially offset the loss on last year's wheat crop, of which so much has been heard.

Cotton is also higher, although the New England mills continue to close and some manufacturers are talking of lower wages.

With warmer weather the demand for refined sugar has improved and Cuban raws are slightly higher. Retail trade has in fact been sensibly stimulated by the rise in temperature and larger sales of seasonable goods are predicted if the hot weather continues. As bearing upon this subject the findings of a statistical friend who believes in the law of average may be interesting. He asserts that the aggregate of the mean temperatures reported day by day east of the Rocky Mountains since the first of March is 297 degrees below the normal and he predicts a very hot summer upon the theory that the deficiency must be made up by the first of October.

In making this prediction he claims that the average temperature from March 1 to October 1 varies but little from year to year. His figures and his conclusions are not vouched for, but they are at least suggestive.

Another theory that is worth considering for its psychological effect is one that is based upon the legend that the Republicans defeated the Democrats in 1896 by "putting up" the price of wheat. It is asserted that they are trying to do the same thing this year and that they are now buying wheat in an effort to elect Coolidge.

The idea seems rather far fetched, but it may prove to be "a good enough Morgan until after the election" and many men are now buying stocks and commodities in the belief that "Big Business" will see to it that we have prosperity from now until election day.

Of course it is a delusion to believe that "Big Business" has any such power, but the South Sea Bubble was also a delusion and in times of political excitement the influence of delusions upon prices is not to be ignored.

But whatever the cause the stock market is undeniably firm, with the railroad shares in the lead and the public utilities a good second. Rumors of railway consolidations grow more numerous. The Van Swearingens are said to have bought the Erie, the Illinois Central is reported to have secured the Gulf, Mobile & Northern, some other road is after the Frisco, and so it goes. No one knows whether the rumors in circulation are true, but most of them are plausible, and the stocks affected are higher.

Fundamentally, cheap money is the cause of the improvement and as there is no present indication of an advance in rates the banks, including the Federal Reserve Banks, are buying government bonds to employ their surplus funds. The six months Treasury certificates recently brought out at 2¾ per cent are now selling on a basis that yields only 2.37 per cent and most other good bonds have advanced sharply.

A reversal of the market trend seems unlikely for some time to come and a partner in one prominent Stock Exchange house has published a carefully argued article prophesying that the upward movement will last for two years.

But there are regions into which the sunshine of Stock Exchange optimism has not yet penetrated. One is the textile industry. It is still subnormal and the talk of overproduction is rife. Another is the shoe and leather trade. The predicted revival has not yet arrived. A third is the steel industry. It is running at not over 60 per cent of capacity and although the seers among the iron masters prophesy better times soon they are slow in coming.

The copper market is also in the doldrums at 12½ cents, which is the lowest price touched for some time. The truth seems to be that the building boom has been checked, and that the demand for both steel and copper is correspondingly curtailed.

But these three or four exceptions, important as they are, do not disprove the general prosperity of the country as shown by bank clearings, which continue to run ahead of last year and the impression grows that the laggard industries will soon catch step with those that are normally active.

In Europe there are no new developments of which America need be afraid and the prospect is for a midsummer of healthy activity after the Democrats have chosen their candidate and gone home to rest up for the fall campaign.

What's Doing in Industry

Machinery and machine tool business showed a slight advance during the past week over widely scattered territories.

Automobile production is curtailed to allow dealers to reduce stocks in preparation for the offering of new models.

Steel shipments continue heavy, but production is only about 50 per cent of capacity. Structural steel buying has been heavy. Reports show that the average output of steel per man has increased during the past two years.

Industrial building awards continue heavy.

Loading of revenue freight decreased for the week ending June 14 by 7,997 cars when compared with the preceding week. Surplus freight cars in good repair are increasing.

Railroad buying is going on, but there is no pronounced drive to replace old equipment. Railroad shares led the stock market last week. Conditions may be affected by consolidations.

A Good Report from France

A machine tool dealer of Paris, writing to the *American Machinist*, sums up conditions in the machinery business in these hopeful words:

"Over here, general business continues good and our business for the first four months of the year was quite on a par with last year's business. We hope it will keep up. Good used machines are getting scarce and we are bringing some from the United States. The automobile business is very good and the taking off of the McKenna duties in England should help it still further."

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Detroit

Detroit is experiencing a period in which the machinery and machine tool business may be termed as good when contrasted with a slowing up in manufacturing lines.

To the casual observer the phenomenon is interesting as well as unique, for there is a decline in general industrial activities. Leaders in the machine tool field are finding business exceptionally good, and there is no fear entertained that this field will go the way of others.

Sales for June are much higher with a majority of companies than was expected, and the number of big jobs still under way, such as those at the Wilson Body Co., the Oakland Motor Car Co., and Ford's give the outlook a distinct rosy hue.

Automobile factories are still curtailing production in order that accumulated stocks may be cleared away by dealers as rapidly as possible. Work on new models is going forward rapidly and the first announcements of improved machines are expected to be made almost any time now.

Movements on railroads show a slight increase during the past week, and there are appearances that the worst part of the slump in this section has been passed.

Milwaukee

The impression presented by a calm survey of the general situation of the metalworking industries as the second half of the year opens is that a change in sentiment has come. It is a favorable reaction from the somewhat depressing developments which occurred in April and May. Probably the most encouraging factor is that in the last two weeks of June the decline in the rate of employment was checked. The peak in the release of men from industries came in May, during which month a decrease of 6 to 7 per cent in number employed occurred.

It would appear, therefore, that industry has shaken itself down and is now on a relatively settled basis, from which, it is confidently believed, the future action will be upward. Among manufacturers there again is talk of capital expenditures for new equipment and extensions, rather than of retrenchment, as was the case during the late winter and spring. This feeling has not yet got past the conversational stage, however, and while inquiry for metal-working equipment of all descriptions is improved, the volume of sales is still maintained with some difficulty.

Manufacturers as well as dealers are watching with increasing interest the development of plans of the Nash Motors Co., Kenosha, Wis., for making use of the former Mitchell automobile works at Racine. Charles W. Nash, in an official public utterance, said late in June that no machinery has been purchased for this plant, as it will not be opened up for manufacturing immediately, although this assuredly will come somewhat later. The tool requirements for this plant will involve upwards of $500,000, according to unofficial estimates. The receiver disposed of the entire Mitchell equipment before selling the real estate and buildings to the Nash company.

While private enterprises are marking time with respect to buying new equipment, municipalities are nearly normal in their purchases of waterworks, light and power machinery. A tendency is now discernible, however, toward delaying the acquisition of such material as cast-iron pipe in anticipation of a lower market, and this feeling is likely to affect purchasing of boilers, engines, pumps, generators, etc., until a marked reaction in iron and steel prices occurs.

Buffalo

A large manufacturer of airplanes reports enough work in hand to keep running on a normal basis for some time ahead on both completed planes and parts. Several satisfactory government orders have been placed and demand from other sources seems to be good.

One distributor of machinery reports that business for June has been better than at any time for the past three months. Although orders come from scattered sources, a certain volume of replacement work is in evidence.

Perhaps because business in general has been somewhat off with many local houses this spring, there has been a greater push than usual after technical school business and several fair-sized sales are reported in Buffalo, Niagara Falls, Jamestown and other cities of lathes, shapers and light wood-working and iron-working machines.

Collections are somewhat worse and the machinery dealers are watching the credit rating of their customers more closely than usual. According to some dealers, small operators are anxious to buy machinery and tool equipment today with a down payment so small that it would not have been considered last year.

Excellent weather for the past few weeks apparently has brought about an active automobile market but automobile reserve stocks have accumulated to such a point that this increased business will not call for much new machinery before next fall, dealers believe. It is not affecting the market perceptably at present.

Fewer road contracts have been let in this end of the state as compared with last year and work in the building trades is quite dull.

Southern District

The Atlanta distributors report a slight improvement during the past two weeks in the volume of machine tool sales made over the southeastern territory, with the last half of June a little better than the first half, and showing a good improvement over the corresponding period last year. June sales over last year improved about 10 to 12 per cent, though dealer reports are inclined to be spotty, some enjoying a 15 per cent better volume, others only about 5 per cent, and some no improvement at all. With the exception of the textile industry, which is still very inactive in the South, most of the principal buying sources have shown some improvement.

The July outlook appears to be good, for inquiries of late have experienced a greater improvement than orders, principally from new plants being constructed, or industrial plants that are carrying out additional construction programs. A considerable amount of these inquiries, however, are for used and rebuilt equipment, this business having been quite active the past month.

Road builders still are buying on a good basis, and with the southern states carrying out one of the largest road-building programs in years, this trade is expected to continue active through the rest of the summer.

Buying by the smaller shops is rather inactive, though early improvement is probable. This is indicated by replies to a questionnaire sent out in June to the members of the Southern Metal Trades Association, fifty replies being received of which number 75 per cent report business fair to good, and the summer outlook good.

Railroads continue to be among the active buyers of heavy equipment. Automotive service stations are buying used equipment principally.

Export trade out of southeastern ports is holding up well, with machinery agencies reporting good bookings.

Indianapolis

The industrial situation has improved materially during the last two weeks in Indiana and the outlook for the metal machinery dealers and tool manufacturers is brighter than it has been since the first of the year. Demand continues low but the number of inquiries shows a marked increase.

During the last two weeks there has been an increase in the production

schedules of several of the automobile plants, reflected in the accessory plants. Thus far this increase has brought no great demand for machinery but small tool demand has been stimulated thereby.

Several inquiries have come from the furniture factories both for woodworking tools and for special machinery.

Buying of milling machinery is reported to be unchanged, according to officials of the Nordyke-Marmon Co., but the number of inquiries leads to the belief that another month will see a big change for the better. E. C. Atkins & Co., manufacturers of woodworking machinery and saws, report an increase in orders from west coast lumber mills. Increases are reported from manufacturers of machinery for candy makers.

New York

The past week in the New York district in the machinery and machine tool market was slow. While a quiet attitude marked the week and all transactions were on a strictly maintenance basis, conditions were somewhat better than the previous week.

The used machine market continues its activity which has been a noticeable factor during the first half of this year.

Large concerns were not in the market for any equipment and no inquiries were made. Small firms sent out a number of letters concerning supplies but very few purchases resulted.

The Southern Ry. System awarded a contract for the construction of a $3,000,000 freight and passenger car repair shop at Hayne, S. C., to the Dwight P. Robinson Co. of New York City.

The Lehigh Valley R.R. is in the market for a dozen or more machines including a pneumatic flanging machine, engine lathes, shapers, etc.

Industrial building contract awards showed a marked money value increase over the two previous weeks. The total for the week of June 26 was $2,422,000 compared with $1,584,000 of the week of June 19. While these amounts are not large, yet they are based upon a minimum award of $40,000.

Canada

Some improvement is reported in the machine tool market of Eastern Canada. Manufacturing interests are showing more confidence in the future and are buying to replace tools that are worn out or obsolete. The call from general industry and from the building trades has stimulated business considerably.

Reports from the steel industry are not encouraging. Important reductions in output have occurred during the last two weeks. There has been considerable curtailment of operation at Sault Ste. Marie. The open hearth shops of the Algoma Steel Corp. finished making steel June 11, following the closing of the rail mill and two of the blast furnaces. The 18-in. and 12-in. merchant mills of the company will continue to operate for some time.

Favorable to Canadian business conditions are the extensive building programs of the railroads. The Senate has placed the seal of approval on the Canadian National Ry.'s branch line program, which means an expenditure of close to $29,000,000 during the next three years, and this added to the Canadian Pacific's big program will put larger sums of money in circulation and provide Canadian plants with orders sufficient to keep them well employed for many months. Foreign trade is a gratifying factor in the present business situation. Exports for May were approximately 40 per cent greater than for May, 1923, and the total trade was ten per cent greater.

The production schedule of the Ford Motor Co. of Canada calls for the manufacture this year of 100,000 cars, according to company officials, 45,000 more than in any previous year. The Canadian General Electric Co. is erecting a $350,00 addition to the plant at Peterboro, Ontario, and a prominent official of the firm states that the upward trend in electrical equipment and automotive supplies, evident since 1921, continues.

Some business seems to exist in the shipbuilding industry. The Collingwood Shipbuilding Co. is taking on additional men. The Canadian Pacific has purchased for its Winnipeg shops a combination turret lathe that admits 7 in. through the spindle and swings 28 in. The sale is understood to be the first in Canada of this type of machine.

Personals

RUSSELL M. KINCAID has been elected vice-president of the Garford Motor Truck Co., Lima, Ohio. Mr. Kincaid was formerly works manager of the U. S. Light & Heat Corp. at Niagara Falls.

E. H. BARNHART has been appointed industrial engineer, with headquarters at Baltimore, Md., of the Baltimore & Ohio Railroad.

JOHN C. MERWIN, since 1917 associated with the Chain Belt Co., Milwaukee, and for several years general works manager, has been elected a director and second vice-president of the corporation.

JOHN C. OLSON, superintendent Flexible Steel Lacing Co., Chicago, is in Los Angeles, Cal., on company business.

DONALD W. KINGSLEY, assistant manager for S. F. Bowser & Co., Dallas, has been made manager of the Detroit office. PAUL W. LAWTHER, of the Fort Wayne sales division, has been made manager of the new Memphis office. E. E. SPRINGER, of the Atlanta office, has been made manager of the new Birmingham, Alabama, office. H. C. CARPENTER, of the Atlanta office, has been given charge of that territory. E. B. FRENCH, manager of the Atlanta office, has been made sales superintendent at Washington, D. C. R. S. CALDWELL, recently at Fort Wayne as assistant sales manager, has been made manager of the enlarged Philadelphia division.

D. A. CRAWFORD, formerly vice-president of the Pullman Co., is president of the new Pullman Car Manufacturing Corp. which has taken over the manufacturing plants at Pullman, Ill., and Michigan City, Ind. CLIVE RUNNELLS is first vice-president, C. A. LIDDLE is a vice-president and W. N. OEHM is works manager.

M. D. CHURCH has been appointed general manager of the Moore Steam Turbine Co., Wellsville, N. Y.

FREDERICK A. POPE is now supervisor of training for the Worthington Pump and Machinery Corp., New York City.

ROBERT W. WEIDENBACKER has been appointed assistant manager of the office for Malaysia of the Baldwin Locomotive Works. His headquarters will be in Java.

W. C. BRUMBLE has been transferred by the General Motors Corp. from his position as assistant manager to the standards department, Chevrolet Motor Co., to the position of production manager of the General Motors International A/S at Copenhagen, Denmark.

S. E. GATES, for fourteen years in charge of the Spokane office, has been appointed manager of the Los Angeles office of the General Electric Co. BERNHARD OLSEN will succeed Mr. Gates as manager of the Spokane office.

JOSEPH KAYE WOOD, at present associated with the Westinghouse Electric and Manufacturing Co., will open an office as consulting engineer in New York City about September 1. Mr. Wood will specialize in engineering dealing with springs.

ELMER H. HAVENS has recently been named president of the new Norwalk Co., formerly the Norwalk Iron Works. Mr. Havens was formerly president of the Locomobile Co., Bridgeport, Conn.

J. W. PETERSON has resigned as works manager of the Locomobile Co., Bridgeport, Conn. E. R. JACKSON will fill the vacancy for the present.

K. A. HILLS has been made manager of the Davenport sales office of the General Electric Co., Davenport, Iowa.

WILLIAM SMITH, president of the New Process Copper Casting Co. of Pittsburgh, has gone to Youngstown to the plant of the Lumen Bearing Co., which company recently took over the New Process Copper Casting Co.

HARRY A. SEVERSON, vice-president and general manager of the Barber-Colman Co., Rockford, Ill., has been elected president of the Rotary Club of Rockford.

C. A. FLANNERY, formerly director of engineering, New Mexico Military Institute, Roswell, N. M., is now mechanical engineer with the Llewellyn Iron Works, Los Angeles, Calif.

W. L. NIES, who has been in charge of the engineering department of the Reynolds Electric Co., has been transferred to the sales department and is now looking after the outside business.

H. A. CARMICHAEL has been elected treasurer of the Westinghouse Electric International Co. to succeed F. L. Townsend who died some time ago.

R. ARMSTRONG has left Canadian Steel Foundries to take up his new duties with the Canadian Brake Shoe and Foundry Co., Sherbrooke, Que., as superintendent.

CHESTER B. HAMILTON, JR., of the Hamilton Gear and Machine Co., Toronto, has been appointed an honorary vice-president of the A.S.M.E. for the purpose of representing the society at the convention of the International Mathematical Congress in Toronto, August 11 to 16.

J. C. BLAIR, Canadian manager for Alfred Herbert, Ltd., England, is returning to Coventry, having been appointed to an important position at the head office of the company he has represented in Canada for the past three years.

GEORGE W. MCLAUGHLIN has retired from active participation in the affairs of General Motors of Canada, Ltd., after 38 years of service with the old McLaughlin Carriage Co. and General Motors.

C. E. BROOKS, chief of motive power of Canadian National Rys., has been elected president of the Canadian Railway Club, Montreal.

DR. EDWIN F. GAY, Professor of Economic History at Harvard University, has been elected a member of the research staff of the National Bureau of Economic Research, with the title of director.

Obituaries

ALBERT GWYNN SPENCER, president of the Safety Emery Wheel Co., Springfield, Ohio, died on June 16, at the age of 65.

ROBERT A. MCNALLY, aged 51 years, of the Railway Equipment Co., Montreal, died June 20. Mr. McNally was a member of the Machinery Club, New York.

Business Items

The Gibb Instrument Co., Bay City, Mich., manufacturers of electric arc and other welding machines, announces that after July 1 the Chicago office will be in charge of W. F. Hebard & Co., 551 West Van Buren Street. Thos. Barnes of the Hebard Co. will head the welding department. He will be assisted by Chas. Watson, who has represented the Gibb Instrument Co. in Japan and United States for many years. The retiring representative, Mr. Hurd, will represent the Gibb Instrument Co. in New England after August 1.

The Underwood Typewriter Co. recently received an order for $75,000 worth of typewriters.

The Autogenous Co. is the new name of the company which was formerly the Autogenous Welding and Machine Co. 1217 Maryland Ave., Baltimore.

The Production Machinery Corp., of New York, has been incorporated for $500,000 to manufacture tools. Corporation Title and Guaranty Co., for correspondence.

The Philadelphia office and service station of the Wagner Electric Corp. has been moved to 1720-26 Callowhill St. Elmer Lingard continues in charge.

The plant and equipment of the Plains Iron Works Co. of Denver, Colo., is to be sold.

The El Paso Electric Co., Wilmington, Del., was recently incorporated for more than $9,000,000 to carry on mining and construction work. Andrew C. Gray, Wilmington, for correspondence.

The Pittsburgh Instrument and Machine Co. has moved into its new quarters at 1026 Reedesdale St., N. S., Pittsburgh, Pa.

The Metal Products Co., Inc., to make and deal in machinery has been incorporated at West Haven, Conn., capitalized at $100,000. The incorporators are Peter J. Oths, Sound View Ave., East Haven; John Garritty, West Haven; Arthur Steiler and Harry J. Port, New Haven.

The United Alloy Steel Corp., Canton, Ohio, has moved its Chicago office to 1440 Straus Building.

The Davenport Foundry Corp., Stamford, Conn., has been incorporated under Connecticut laws. The incorporators are Wm. L. Buckley, Sara F. Primrose and Alice M. Deery, all of Bridgeport. Capitalization, $300,000.

The Robert June Engineering Management Corp. of Detroit has moved to 8835 Linwood Ave.

The Andrews' Machine Co. of Auburn, Me., recently incorporated, has absorbed the Andrews Machine Shop. The new company is putting up buildings for a machine shop.

The Motor Wheel Corp., Lansing, Mich., closed its plants on the 28th of June for two weeks. This is the first time Motor Wheel has tried a general vacation plan. All production divisions as well as clerical and administrative forces are affected.

Construction of the buildings of the new assembly plant of the Ford Motor Co. at Charlotte, N. C., is practically complete and the new factory will be in operation about August 1. A capacity of between 300 and 400 cars daily is scheduled for production.

The Indiana Pump and Tube Co. has changed its principal place of business from Indianapolis to Greenwood, Ind., about ten miles south of Indianapolis.

C. B. Preifer and Rumsey M. Haynes, formerly with the Kirchen Machine and Supply Co., Lansing, Mich., have purchased the mill and factory supply portion of the business, and have incorporated under the name of the Mill and Supply Corp.

The F. N. Wilson Machinery Co., manufacturers of and dealers in heavy machinery, formerly located at 321 West 35th St., recently moved to its new building at 3131 Shields Avenue, Chicago, Illinois.

Samuel T. Freeman & Co., auctioneers, announce removal to their new building, 1808-10 Chestnut St., Philadelphia.

The Anderson Stove Co., Anderson, Ind., which has been operating on a reduced schedule for two weeks, has resumed its normal hours and working force.

The Bronze Piston Ring Co., of Indianapolis, has opened an office and plant at 910 N. Illinois St.

Trade Catalogs

Automatic Surface Grinders. The Blanchard Machine Co., 64 State St., Cambridge, 39 Mass. A catalog devoted to illustrations of various classes of work handled on this machine, with complete production data. Brief description and specifications are also given.

Bench Milling Machines. Weed Engineering Works, Inc., Bridgeport, Conn. Four-page circular briefly illustrating and describing its bench milling machines, also giving general specifications.

Pumps. Chicago Pneumatic Tool Co., 6 East 44th St., New York. Bulletin No. 711, a 24-page circular is devoted to the subject of vacuum pumps. It gives complete details of construction with numerous illustrations of its pumps.

Ladles. Whiting Corporation, Harvey, Ill. Catalog No. 172 supersedes No. 161 issued by this company. It contains complete description of the company's various types of ladles, together with tables of standard sizes, also cuts of repair parts and repair part list.

Heat Treatment of Steel. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Catalog No. 90 issued by this company describes and illustrates the Hump method for treatment of steel. Prices of electric furnaces and furnace accessories are also given.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Boilers and engines, with complete equipment. Purchase. Reference No. 10,671.

Conveyors and friction hoists. Agency. Reference No. 10,680.

Engines, 40 to 50 hp. Agency. Reference No. 10,679.

Engines, steam, vertical and compound. Purchase. Reference No. 10,671.

Pneumatic hammers for chipping and riveting. Agency. Reference No. 10,676.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Fourth annual machine tool exhibit, Sept. 15-18. Mason Laboratory, New Haven, Conn. H. R. Westcott, chairman.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Foundrymen's Association. Twenty-eighth annual convention. Milwaukee, Wis. Week of Oct. 13, 1924.

National Industrial Advertisers Association. Annual meeting, Edgewater Beach Hotel, Chicago, beginning October 13, 1924.

Management Week. Under the auspices of the American Society of Mechanical Engineers. Week of Oct. 20, 1924. New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Curtailment of pig-iron production continues. Price of No. 2 fdry iron remained unchanged during the week at $20@$21 per ton, Birmingham. Iron demand extremely slow. Slight improvement in demand for steel bars, sheets and pipe. Steel bars and structurals are now $2.20 per 100 lb., Pittsburgh. Plates, the weakest of the heavy rolled steel products, are $2.10@$2.20 per 100 lb. at mill. These quotations are slightly under the price levels of a month ago.

Non-Ferrous Metals—Rise in foreign tin reflected in advance of 1c. per lb. in New York warehouses. Copper market sentiment better; no change in prices during week. Lead demand slow; price down ⅛c. per lb. in New York since June 20. Zinc market quiet, prices unchanged.

(All prices as of June 27)

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	20@21
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	$2.80@3.00	4.14	3.55	4.00
No. 12	2.90@3.10	4.19	3.60	4.05
No. 14	3.00@3.20	4.24	3.65	4.10
No. 16	3.20@3.40	4.34	3.75	4.20
Black				
Nos. 17 and 21	3.60@3.70	4.55	4.25	4.55
Nos. 22 and 24	3.65@3.75	4.60	4.30	4.55
Nos. 25 and 26	3.70@3.80	4.65	4.35	4.60
No. 28	3.75@3.85	4.75	4.45	4.70
Galvanized				
Nos. 10 and 11	3.75@4.00	4.80	....	4.60
Nos. 12 and 14	3.85@5.10	4.90	....	4.70
Nos. 17 and 21	4.15@4.40	5.20	....	5.00
Nos. 22 and 24	4.30@4.55	5.35	5.00	5.15
No. 26	4.45@4.70	5.45	5.25	5.30
No. 28	4.75@5.00	5.75	5.55	5.60

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	4.59	3.96@4.46	4.55
Cold rolled strip steel	7.50	8.25	7.40
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	4.10	4.00
Cold drawn flats, squares	4.90	4.60	4.50
Structural shapes (base)	3.44	3.31	3.30
Soft steel bars (base)	3.34	3.2.	3.20
Soft steel bar shapes (base)	3.34	3.21	3.20
Soft steel bands (base)	4.09	3.61	3.95
Tank plates (base)	3.44	3.31@3.55	3.30
Bar iron (3.00 at mill)	3.49	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	60%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.00
Tin, 5-ton lots, New York			44.75
Lead (up to carlots), St. Louis	6.75	New York	7.50
Zinc (up to carlots), St. Louis	5.75	New York	6.50

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	27.20	28.00	28.50
Antimony (Chinese), ton spot	9.50	10.50	10.00
Copper sheets, base	19.50	19.75	23.00
Copper wire, base	15.00	17.50	16.25
Copper bars, base	18.75	20.75	19.50
Copper tubing, base	21.75	25.75	23.00
Brass sheets, base	16.25	20.50	18.75
Brass tubing, base	20.50	25.50	20.50
Brass rods, base	14.00	16.50	15.75
Brass wire, base	16.75	20.50	.....
Zinc sheets (casks)	10.50	10.75	.....
Solder (½ and ½), (case lots)	34.75	30.00	30.00
Babbitt metal (83% tin)	60.00	56.00	48@52
Babbitt metal (35% tin)	28.00	17.50	23@26
Nickel (ingot and shot) f.o.b. refinery	27.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	30.00	.....	35.00
Nickel (F shot) f.o.b. refinery	30.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Shop Materials and Supplies

METALS—Continued

Manganese nickel hot rolled rods "E"—low manganese (base) 54. 00
Manganese nickel hot rolled rods "D"—high manganese (base) 57. 00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32. 00	Hot rolled rods (base)	40. 00
Blocks	32. 00	Cold drawn rods (base)	48. 00
Ingots	38. 00	Hot rolled sheets (base)	42. 00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00@10. 75	10.00	10. 75
Copper, heavy, and wire	9. 62½@10. 50	9. 50	10. 00
Copper, light, and bottoms	8. 50@ 9. 00	8. 00	9. 00
Lead, heavy	5. 62½@6. 00	5. 00	6. 50
Lead, tea	4. 37½@5. 00	3. 00	5. 50
Brass, heavy, yellow	6. 50		6. 50
Brass, heavy, red	8. 50 @8. 75	8. 50	8. 50
Brass, light	5. 75	4. 50	6. 00
No. 1 yellow brass turnings	6. 50 @6. 75	5. 50	6. 50
Zinc	3. 50 @3. 75	3. 50	3. 50

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$24. 30	$22. 85	$18. 50
"A" Grade:				
IC,	20x28, 112 sheets	20. 20	18. 00	17. 00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14. 00	13. 00	14. 50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8. 25	6. 55	7. 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0. 14@0. 21	$0. 20	$0. 14
Cotton waste, colored, per lb.	. 09@ .12½	.17	. 10½
Wiping cloths, 13¼x13¼, per lb	11. 25*	36. 00 per M	. 16
Wiping cloths, 13¼x20½, per lb.	....	52. 00 per M	. 16
Sal soda, per 100 lb.	2. 40	2. 25	2. 65
Roll sulphur, per 100 lb.	3. 60	3. 25	3. 50
Linseed oil, per gal., 5 bbl. lots	1. 00	1. 09	. 94
Lard cutting oil, 25% lard, per gal.	. 55	. 50	. 79†
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	. 35	. 40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber transmission:			
First grade	50%	50–10%	40–10%
Second grade	50–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5. 40	$5. 84	$6. 48
Emery paper	9. 90	11. 00	8. 80
Emery cloth	31. 12	31. 12	25. 48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1. 49	1. 24	1. 40
Cloth	3. 38	2. 67	3 20
Fire clay, per 100 lb. bag	....	. 65	. 60
Coke, prompt furnace, Connellsville	per net ton		3. 25@3. 50
Coke, prompt foundry, Connellsville	per net ton		4. 50@5. 00
White lead, dry or in oil	100 lb. kegs		New York, 14. 50
Red lead, dry	100 lb. kegs		New York, 14. 50
Red lead, in oil	100 lb. kegs		New York, 16. 00

*White, at washery.
†Chicago quotes on pure lard oil, No. 1 grade.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0 0334	$0 0349	$0 0354
Cold finished shafting	per lb.	0.044	0 044	0 044
Brass rods	per lb	0.14	0.145	0.18
Solder (½ and ½)	per lb.	0.3475	0.3475	0.345
Cotton waste	per lb.	.14@.21	.14@.21	.10@.13
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	0.55	0.55	0.65
Machine oil	per gal.	0.29	0.29	0.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	50%	50%	30%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	50%	60–10–5%	55–5%
1½ and 1¼x3 in. up to 12 in	15%	60%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	40%	$3. 50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	3. 50 net	$4. 00 off
Button head bolts, with hex. nuts	10%	List net	3. 50
Hex. head and hex. nut bolts	10%	.....List plus 10%	
Lag screws, coach screws	50%	.....	50-5%
Square and hex. head cap screws	75%	75%	75–5%
Carriage bolts, up to 1 in.x30 in.	40%	60%	50–5%
Bolt ends, with hot pressed nuts	50%	.....	55-5%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅝ and smaller	70%	.....	.....
Semi-finished nuts, ¾ and larger	65%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6. 50	$4. 00	$4. 00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5. 50	4. 00	4. 00
Washers, round plate, per 100 lb. Off list	1. 50	4. 50	4. 00
Nuts, hot pressed, sq., per 100 lb. Off list	1. 50	4. 00	3. 50
Nuts, hot pressed, hex., per 100 lb. Off list	1. 50	4 00	3. 50
Nuts, cold punched, sq., per 100 lb. Off list	1. 50	4. 00	3. 50
Nuts, cold punched, hex., per 100 lb. Off list	1. 50	4 00	3. 50
Rivets:			
Rivets, ⅞ in. dia. and smaller.	50%	60–10%	60%
Rivets, tinned	50%	60–10%	4½c. net
Button heads ¾-in., ⅝-in., 1x2 in. to 5 in., per 100 lb. (net)	$5. 00	$3. 50	$3. 75
Cone heads, ditto (net)	5. 20	3. 60	3. 95
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0. 25	.....	0. 15
¾ in. diameter *EXTRA*	0. 35	.....	0. 15
½ in. diameter *EXTRA*	0. 75	.....	0. 50
1 in. long, and shorter *EXTRA*	0. 75	.....	0. 50
Longer than 5 in. *EXTRA*	0. 50	.....	0. 25
Less than 200 lb. *EXTRA*	0. 50	.....	0. 50
Countersunk heads *EXTRA*	0. 45	.....	$4. 20 base

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ky., Louisville—Office of United States Engineer, P. O. Box 72—bolt threading machine, up to 1¼ in. bolts.

Mass., Arlington (Boston P. O.)—Town—machine shop equipment, including monorail crane.

Mich., Detroit—A. J. Linnartz, 3768 Second Ave.—machine shop and tool crib equipment.

Mich., Iron Mountain—Holfeltz & Eisele Co.—coal unloading crane.

N. H., Gorham—P. H. McLain—6 in. four side moulder.

N. Y., Lockport—Jefferson Union Co., R. E. Bryant, Vice-Pres., Grand and Gooding Sts.—machine shop equipment.

N. Y., New York—Lehigh Valley R.R. Co., 143 Liberty St.—one 36 in. to 42 in. vertical boring mill, three 3 ft. radial drills, two 34 in., one 40 in. Newton crank shapers two 20 in. x 8 ft., and two 16 in. x 6 ft. engine lathes, one 32 in. Newton crank planer, one 36 in. draw-cut shaper, one McCabe pneumatic flanging machine.

O., Columbus—Huffman-Wolfe Co., 669 North High St.—sheet metal working machinery to enlarge shop.

O., Columbus—E. A. Prentice Co., Vine & Armstrong Sts.—sticker, 9 in. molder, and tennoner.

Pa., Danville—E. W. Peter, 103 Lower Mulberry St.—2,000 lb. Erie or Chamberlin double leg steam forging hammer.

Wis., Fort Atkinson—Klement Bros.—boring machine, emery grinder, etc.

Wis., Wausau—H. A. Bauman, 109 4th St.—20 in. drill press, air compressor and chain hoist.

Wis., Webster—Peavey Motor Co., C. E. Peavey, Purch. Agt.—lathe and drill press.

Que., Beauharnois—Leduc & Fortin—planers, saws, etc.

Que., Cazaville—A. Lapierre—equipment for blacksmith shop.

Que., Chateauquay—J. A. McCracken—bench lathe and other equipment for public garage and repair shop.

Que., Cowansville—S. Poulin—machinery for sash and door mfg.

Que., Laprairie—O. Roy—equipment for foundry, furnaces, etc.

Que., Lennoxville—W. A. Brown—planing mill machinery.

Que., Pont Chateau—A. Blanchard—lathe, drill press and emery grinder.

Que., Pont Chateau—O. Gauthier—machinery for planing mill.

Que., Richelieu—A. Desroches—small lathe and equipment for garage and auto repairs.

Que., St. Clet—A. De Repentigny—planer and saw.

Que., St. Nazaire d'Acton—J. B. Collard—saw mill machinery.

Ont., Stratford—J. R. MacDonald (threshing engines and machinery)—complete equipment for $50,000 plant.

Que., Upton N. Actonvale—A. Desmarais—vertical post drill.

Que., West Shefford—S. Rousseau—saw mill machinery and equipment.

Opportunities for Future Business

Calif., Stockton—Western Pacific Railway Co., Poplar and Sacramento Sts., had plans prepared for the construction of roundhouse and shops, also machine shops. Estimated cost $69,500, and $45,000 respectively. Private plans.

What This Section Is

Machinery Requirements and Industrial Construction is a reliable machinery market, because every item is reported first-hand by our own correspondents, scattered over the United States and Canada. These leads are verified by our men. We do not use newspaper clippings, nor do we listen to any hearsay or rumors. These sales leads are as accurate as our men can make them, and as timely as weekly publication will permit.

This market is for *American Machinist* subscribers. It covers the same machinery fields as does the paper. Here will be found inquiries for machine tools, presses, hammers, welding, forging and heat treating equipment, wood working machinery, cranes, hoists and other material handling machinery for the shop.

Here also will be found reports of proposed industrial construction, where sooner or later machinery will be needed.

Are you making the most of the opportunities listed here?

Conn., Hartford—O. B. Herlth Co., 272 Tolland St., East Hartford, (machinery and tools), having plans prepared for the construction of 1 story, 35 x 25 ft. office and 50 x 100 ft. factory additions. Estimated cost $40,000. E. L. Morey, 33 Rector St., Archt.

Conn., New Haven—F. Teitelman and L. Rudnick, 350 Congress Ave., having plans prepared for the construction of a 1 story, 50 x 150 ft. mill, for manufacture of store fixtures. C. H. Abrahamowitz, 82 Church St., Archt.

Mass., Arlington—Town is receiving bids for the construction of a 2 story, 80 x 80 ft. fire station and machine repair shop, on Massachusetts Ave. & Broadway. McNaughton & Robinson, 46 Cornhill, Boston, Archts. Estimated cost $150,000.

Mass., Lynn—Stevens-Mader, Inc., 75 Exchange St., awarded the contract for the construction of a 3 story, 50 x 180 ft. service and repair bldg. Estimated cost $150,000.

Mass., Watertown—F. B. Webb Mfg. Co., 50 Elm St., Boston, manufacturers of plumbing supplies, awarded the contract for the construction of a 1 story, 100 x 60 ft. factory and warehouse, here. Estimated cost $40,000.

Mich., Iron Mountain—Ford Motor Co., Highland Park (Detroit P. O.), awarded the contract for the construction of a 2 story, 82 x 260 ft. sawmill. Estimated cost $275,000. Noted June 12.

Mo., St. Louis—G. Seeley, c/o Botteroff-Giles Co., 4914 Delmer Blvd., awarded the contract for the construction of a 4 story, 100 x 152 ft. garage on Walnut and 11th Sts. Estimated cost $300,000. Noted April 17.

O., Cleveland—Allen-Osborn Co., Archts., Rose Bldg., will receive bids until July 15th, for the construction of 1 and 2 story, machine and structural shops, pattern storage and office building, on Harvard St., for the O. C. Barlett & Snow Co., French & Winter Rds. Estimated cost $200,000. Noted Apr. 24th.

O., Columbus—Columbus Bolt Works Co., J. R. Foot, Pres., Water and Chestnut Sts., awarded the contract for the construction of a 3 story, 100 x 240 ft. factory. Estimated cost $300,000. Noted June 5.

Pa., Philadelphia—The Berroden Auto Supply Co., 713 North Broad St., awarded the contract for the construction of a 3 story, 130 x 67 ft. factory, on Broad and Olive Sts. Estimated cost $150,000.

Pa., Phila.—The Phila. Rapid Transit Co., 8th and Dauphin Sts., has awarded the contract for the construction of extension to car barn, including 1 story, 352 x 110 ft. shop and inspection bldg., 290 x 12 ft., 42 x 20 ft. wing, sand handling bldg., 160 x 80 ft. trackless trolley bldg.

S. C., Spartanburg—Southern Railway System, 1300 Pennsylvania Ave., Washington, D. C., awarded the contract for the construction of freight and passenger car repair shops, at Hayne, near here, including 390 x 108 ft. steel freight car repair shop, equipped with electrically operated traveling crane; 130 x 50 ft. machine shop annex, 240 x 180 ft. coach shop; 105 x 55 ft. wheel shop; 160 x 100 ft. smith shop; 160 x 100 ft. planing mill; 90 x 50 ft. power house; 60 x 35 ft. reclaiming shop, service crane with 60 ft. span in runway 760 ft. long, etc. Estimated cost $3,000,000.

Tex., Corsicana—The Clopton Planing Mill Co., 213 East 4th St., has awarded the contract for the construction of a planing mill. Estimated cost $75,000. Noted May 15th.